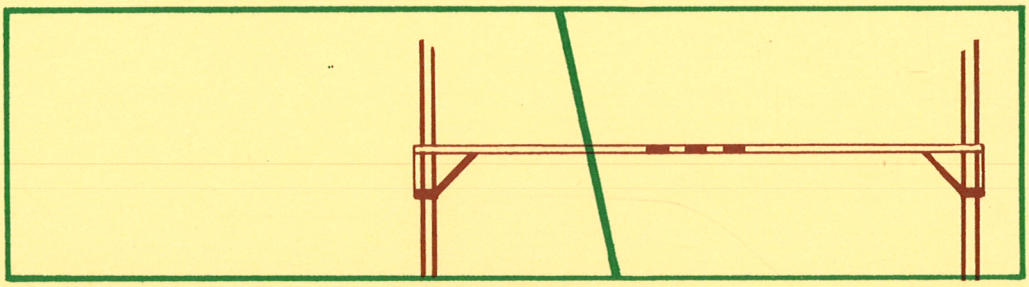

Artificial Surfaces for Recreation

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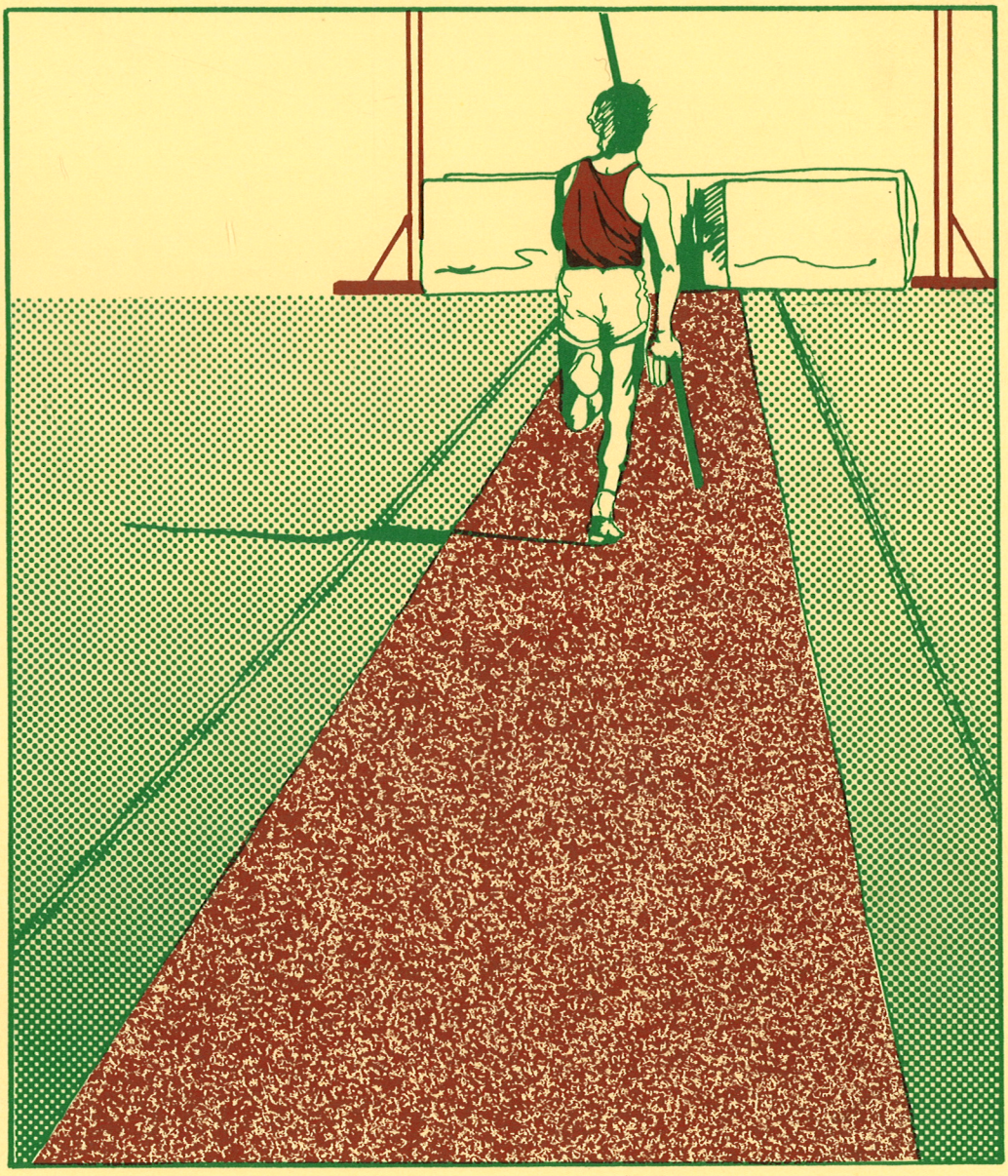

Department of Horticulture Landscape and Parks

Lincoln College, University College of Agriculture

Artificial Surfaces for Recreation

Bulletin Number 37

A report of the proceedings of a Block Course held at Lincoln College, Canterbury, May 11-14 1981. The course was designed to study and evaluate the range of artificial surfacing material currently available for indoor and outdoor recreational facilities.

Edited by J.O. Taylor

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Lincoln College, Canterbury. January 1982.

FOREWORD

In opening the Block Course on Artificial Surfaces for Recreation, Mr Lance Cross, C.B.E., Chairman, New Zealand Council for Recreation and Sport, quoted from a U.N.E.S.C.O. Survey that over the next 25 years the major problem facing the world as a whole, will be the effective use of leisure time. He went on to develop the theme that maximum use must be made of facilities already existing before expensive new recreation and sports arenas were developed. On a population basis, New Zealand needs only four standard Olympic pools, but many lido-type pools are still required.

Local Authorities are faced with ever rising costs for the provision and maintenance of play grounds, sports grounds and recreational facilities, but the trick of how to reduce these costs, let alone maintain costs, eludes most experts today.

The aim of the Block Course was to study the range of methods and materials available for the construction of artificial surfaces used in recreation and to come up with some positive ideas on what can best be used inside and outside to provide more effectively for the requirements of our recreating communities.

Hopefully, these proceedings will be of use in alerting Local Authorities to the thousand and one questions and answers which must be considered when embarking upon a new recreational facility.

ACKNOWLEDGEMENTS

To Mr R.J. Jones who assisted greatly with the programme planning and field trip co-ordination.

To those persons who willingly gave time and offered helpful advice and comment during the field visits to the Burnside High School, Christ's College, Hagley Indoor Sports Centre, Pioneer Sports Stadium, Wilding Park, the Queen Elizabeth II Sports Stadium, Morgan and Pollard Ltd., Road Carpets Ltd.

To all those who contributed papers and to the speakers at the seminars.

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ALL WEATHER SURFACES FOR SPORT AND RECREATION

R.J. Jones

Summary

During the morning's session we will examine the entire artificial and all-weather concept as it is applied to the Sport and Recreation field.

We will look at the base construction and drainage required for an All-Weather Surface, look in some detail at the various types of surfaces available in New Zealand and their composition, take each sport both indoor and outdoor and look at the various types of all-weather and artificials which can be used and are in present use, and finally, look at some illustrated examples of how the various materials have been applied here in New Zealand.

Introduction

To a certain degree, my emphasis today will be on surfaces for athletics and tennis. However, what I will be telling you can just as succesfully be applied to any sport or recreation activity which requires an all-weather, that is, an artificial surface. My reason for concentrating on athletics and tennis is because the major developments with artificial surfaces have been in the athletics and tennis areas. Also, my personal experience has been mainly in these two sports.

An artificial surface for sport in the main means an all-weather surface. Indoors, of course, it is artificial as there is no need to be all-weather.

The first question I will pose is - *Why have an artificial surface?*

To a certain extent, New Zealand sports administrators and providers of facilities have been caught up in a world wide trend. There are more leisure hours today than ever before and people of all age groups are seeking better facilities.

With the possibility in the future of a basic 35 hour week, people will have even more time to spare for sport and recreation activities. Per capita in New Zealand, more people participate actively in some sport than in any other country.

The Government has also become involved by setting up the Council for Recreation and Sport to provide money for the development of sports facilities.

Many sports now require special surfaces and in some cases international bodies of some sports are approving surfaces and even specifying them.

Local Authorities which provide subsidies for facilities are moving away from the one sport, one area concept and towards multi-sport facilities. This is particularly noticeable in the sports hall concept where a covered area is provided for multiple indoor sports use such as badminton, tennis, basketball, volleyball, gymnastics, etc. A resilient artificial surface has been found to be more adaptable and suitable for multi-purpose use than a timber floor.

Overseas trends have accelerated the demand for all-weather sport and recreational surfaces in New Zealand which can be used all the year round.

Local Bodies have serious problems in providing these top recreational facilities and yet still holding their rates. On the other hand, greatly escalating maintenance costs are prohibiting growth and expansion of existing facilities.

This leads me to my next question - *What are the Advantages of an All-Weather or Artificial Surface?*

One of the major advantages is that of maintenance costs. The initial cost outlay is soon balanced out by the future low maintenance cost for the surface. A further advantage is that an all-weather surface allows for a greater use by a larger number of participants - especially when the weather factor is considered.

Here I would like to give you an example to reinforce that statement. One particular Council in New Zealand has to provide grass wickets for their local grade cricket (the same as many other Councils also do). In 1977 they found the maintenance cost per

season per wicket to be approximately $500 - $1,000. This Council then installed two artificial all-weather wickets at a cost of approximately $1,500 each. Therefore, you can see that in two seasons these wickets will have paid for themselves.

An athlete's performance is improved; the resiliency of most surfaces gives comfort and therefore less muscle soreness and injury. The surface is non-slip and cooler which is better for both training and competition. In many cases athletes now refuse to run on grass in Southland and Taranaki. (N.Z.A.A.A. 1972 ruling for Nationals and International meetings.)

Finally, the performance and playing characteristics can be varied to suit individual requirements, e.g. Chevron high stress.

Base Construction

Before outlining typical base design and construction I would like to stress one very important point - any surface is only as good as the base which is put underneath it.

In most cases, the base construction will be of the metal and asphalt type. However, for small areas such as cricket wickets and athletic strip runways, I would recommend reinforced concrete (100mm thick, metal base if necessary first, HRC mesh, broom finish). Normal base can be divided into drainage (edging), metal courses (base course, topcourse), asphalt layer, asphalt tolerances (degree of accuracy).

Drainage: the success of any all-weather surface relies on the shedding of stormwater off the surface to the sides. Therefore a good drainage system must be installed to remove this shed water quickly from the area. One exception to this is the porous concrete type construction.

First All-Weather Surfaces in New Zealand, Porous Concrete

Problems have been experienced with cracking and spoiling of edges, blockages of pores and under drains, hard on feet and can be slippery when wet. Good example - Wilding Park, bad one - Mitchell Park, and many others.

Edging: must be permanent, preferably concrete. It is the control for the whole job.

Metal courses: to normal city subdivisional standards. Strength to give Benkelman Beam readings in the order of 1.78mm (70 thou), varies from area to area of New Zealand.

Asphalt

This is used as both a levelling course over the top of the metal and as a surfacing course on which to install the artificial surface.

Asphalt tolerances: one of the secrets of a good all-weather surface installation is the accuracy to which the asphalt surface is refined to. As it is to be later covered up by proposed all-weather surface the asphalt surface can be refined to a high degree of accuracy by burning off highs and patching lows. This is necessary because the all-weather surface is an even thickness layer which will follow contours of asphalt surface. Therefore, large areas will be up and down and small areas too thick or thin. Crossfall 1:100. Surface tolerance ± 3mm in three metres.

History and Development of Artificial All-Weather Surfaces

The development of artificial surfaces in New Zealand for sport and recreation has generally followed the lead set by the western world (particularly Europe and North America), but several years behind them. Many surfaces at present in use in New Zealand were at the time they were installed the best available (product and for price), but are not necessarily still the best as they have been superceded by improved surfaces (materials, concepts, etc.).

1. Cinders

High maintenance: levelling, rolling needed; watering, but gets waterlogged when wet. Dirty, dusty (especially during wind), lines need constant attention.

2. Asphalt Based Surfaces - the Beginning of True All-Weather Surfaces

2.1 Straight asphaltic concrete (tennis). Difficult to

construct to high degree of tolerance, usually not puddle free and therefore not all-weather. Most need periodic topdressing; high degree of ball wear, hot for feet, not resilient, so hard on feet.

2.2 Grasstex (athletics and tennis), asphalt/asbestos fibre surface, no resiliency, very hard surface, high maintenance.

2.3 Elastomer Modified Asphalt (RUBKOR). Rubberised asphalt surface, economical, resilient, low maintenance surface (refer to Role of Asphalt).

3. Porous Concrete (Also asphalt)

Hard to convert later to a synthetic surface. Not sound engineering principal.

4. Synthetics

The bulk of all-weather surfaces now available throughout the world are of the artificial synthetic type composition. Broadly, they fall into three categories:

4.1 Cast-in-situ, Polyurethane or Neoprene Latex Surface

Chevron, Tartan, Elastaturf, to name but three. (There are over 30 types available throughout the world.) These are normally multi-layer synthetic compositions consisting of:

4.1.1 Baselayer: thickness 5mm to 12mm Urethane or Neoprene liquid binder, activator or setting agent and rubber granule filler. Normally black in colour.

4.1.2 Textured Surface: coloured granules, either synthetic or natural rubber of varying shapes.

4.1.3 Final Coating: coloured synthetic liquid. Helps bind granules. Increases colour life. (Typical mixing and laying process described.)

4.2 Acrylic Latex Synthetic

Decoralt, Supreme Tennis Top, Laykold, etc. Also cast-in-situ. These are normally single layer systems which are applied in a multiple number of coats to give the required thickness.

They consist of:

Acrylic Latex (modified) Emulsion
Hardener
Coloured liquid pigment
Fine quartz sand
Filler (optional)
(Acrylic Latex binders have replaced PVA binders.)
(Typical mixing and laying process for Decoralt described.)

4.3 Pre-cast Synthetic Rubber of the P.V.C. Family

Polytrix, Mondoflex, Uniturf.
These are pre-manufactured, normally supplied in rolls of 1.5 metre width and are stuck down to a suitable asphalt or concrete base using a special, two pot, epoxy adhesive.
(Various thicknesses 3m to 11m.)

5. Artificial Grasses

Instant Grass (Mod-Grasse), Astroturf. (Montreal hockey surface.)

Before examining the application of the various surfaces to the various sports, I would like to make a few general comments on all-weather surfaces.

In general, the cost of the various types and compositions of synthetic materials can be related fairly directly to the quality of the material, i.e. life, amount of wear, maintenance (ease of, cost, regularity), playing characteristics. In other words, in most cases you get what you pay for. (Example of Polytrix and Mondoflex at Palmerston North Showgrounds.) In most cases each particular surface has been designed specifically for one, or at the most two, exact uses. Very few are suitable for multi-use.

6. Elastimer Modified Asphalt

(E.M.A.): Rubkor is one of the few surfaces available today which is adaptable and suitable for multi-sport use. This is because the resiliency of the surface can be varied by altering the % of additive into the asphalt mix and therefore a suitable resiliency can be achieved for cricket, tennis, athletics, playgrounds, etc., in fact, virtually any sport which requires an artificial

all-weather surface (refer to Role of Asphalt).

All artificial, all-weather surfaces require some maintenance, some more than others. High stress areas wear and the acrylic latex surfaces need periodic recoating; lines need remarking and maintenance should always be carried out before wear becomes excessive.

Most of you will realise that already the all-weather surface field in New Zealand is a large one, especially when you consider the small population. (Australia with 12 million has only about six all-weather tracks; New Zealand has six also.)

It is growing larger as more surfaces are developed and introduced. In the past the oil companies, particularly in the U.S.A., have had a big part in the development of the synthetics as off-shoots of their petroleum products. Now the field has changed slightly with the introduction of more specialist organisations into the market.

Application of Surfaces to Sports

1. Indoors

1.1 Gymnasiums, multi-purpose sports halls.
Timber (discussed by others).
E.M.A. (Rubkor) + synthetic topping (acrylic latex synthetics - both C-in-S, and precast.
Uniturf, Polytrix, Mondoflex.
Supreme Court

All of the synthetics can be laid on either asphalt or concrete base. They can also be put on existing timber surface.

1.2 Squash Courts
Still almost entirely timber. Some developments overseas towards synthetic artificial surfaces. (Has problems particularly with movement around court.)

2. Outdoors

Athletics
- cinders (now superceded)
- Grasstex " "
- E.M.A. RUBKOR (Hastings, Invercargill)
  RUBKOR 80
- Synthetics

Cricket	-	Feltex type thin carpet (short life, poor wearing)
	-	E.M.A. + synthetic coating
	-	P.C. synthetic - Uniturf, expensive, prone to vandals, slippery when wet.
	-	Several other materials available overseas.
Tennis + Netball	-	Asphalt
	-	Porous material
	-	Acrylic latex (on asphalt or E.M.A.)
	-	Supreme Court
	-	Synthetic - Elastaturf, P.C. (very expensive, not for clubs or public courts).
	-	Artificial Grass - Mod Grass (has problems - high rainfall areas).
Hockey	-	E.M.A., RUBKOR 80.
	-	Astroturf (Rolls Royce, but very expensive).
Play-Grounds	-	(other speaker will deal with this in depth).
	-	E.M.A. (RUBKOR)
	-	Elastaturf + P.C. synthetics (expensive).

Other Areas

Softball Diamonds	-	synthetics and other artificial type surfaces not suitable.
Ice Rinks	-	material available overseas and through S.A.W.S. in New Zealand. W.L.S. experience in France expensive.

Supreme All Weather Surfaces

S.A.W.S. Company - specialise in all-weather surfaces. Evolved from experience and interest created by construction of track at Q.E.II and Melbourne Olympic Park.

Surface materials supplied by U.S.A. and European Company reputed to be biggest in world. Direct access to latest developments, enable us to keep pace with constant up-grading and improvement of all-weather surfaces.

Company backed by experienced importing and marketing group, engineering and design, trained specialist surface applicators.

Base work is done by selected local contractors in each area or can if so desired by Council to our plans and specifications.

Company offers full service including site investigation, engineering design, installation of base and final surface.

Samiseal

The Samiseal materials are specially designed for maintenance work such as joint and crack filling in asphalt and concrete, and for shock and stress absorbing. It may be applied hot or cold.

Heavily used EMA run-up surface for long jump.

THE ROLE OF ASPHALT IN SPORTING SURFACES

R.J. Jones

Summary

This paper examines the application of elastomer-modified asphalt (E.M.A.) mixes for various sporting surfaces. Details are given on the correct level of resilience required for each sport and how it is selected.

The advantages and disadvantages of E.M.A. versus synthetics are tabulated, both from the sporting and engineering aspect. Modifications to the basic surface are described in areas where this special asphalt material forms an integral part of the surface system.

Experience in the use of E.M.A. mixes for a variety of sports is outlined and potential future uses in Australasia are examined in line with similar experiences in Europe and North America.

1. Introduction

With the continual pressure towards shorter working weeks, the demand on sports and recreation facilities is increasing with the result that heavier strains are being placed on conventional natural turf surfaces.

Government, Local Authorities and private sports bodies, the main providers of sport and recreation facilities, are being forced to turn more and more towards the installation of all-weather surfaces to meet the demand from the public and to reduce the continually rising maintenance costs imposed by grass surfaces. Initial capital outlay can soon be recouped from future low maintenance costs.

The use of elastomers to modify conventional hot asphalt concrete mixes is certainly not new in the sports field and, in fact, has been in use considerably longer than the synthetic rubber

all-weather surface. The first rubber/asphalt surfaces appeared in the U.S.A. in the mid 50's whereas the first synthetics were not introduced until some 10 years later. The advent of the synthetic materials tended to push the rubberised asphalt type surface into the background, particularly in Europe and North America where a lot more money per capita is made available for sport. However, it is significant to record that an estimate in the early 1970's put the total area of RUBKOR (the proprietry E.M.A. mix with which this author is most familiar) laid throughout the world as in excess of 10 million square metres - most of this being in Europe and North America.

In Australasia, the high cost of imported synthetic materials, has meant that only a few select sports bodies can afford these deluxe type surfaces. This has resulted in a large market opening up for the considerably more economic E.M.A. type surface.

2. Material Composition

The basic composition of the most successful of the E.M.A. mixes, RUBKOR, consists of three main components:

2.1 Graded mineral aggregate - normally within the range of 100% passing a 5mm sieve to nil % passing the 75 micron sieve.

2.2 Bitumen - 180/200 penetration grade.

2.3 RUBKOR Elastomer Additive - a specially manufactured material consisting of graded solid rubber particles, graded cork particles, and other chemical components, all of which help to play a part in the correct performance of the finished product.

The addition of the RUBKOR elastomer additive to a conventional hot asphaltic concrete mix during the batch mixing process renders the resultant asphalt mix resilient. The process is a relatively simple one to mix and handle and causes no problems on a modern batch mix asphalt plant. Tight control is, however, required on areas such as temperature, compaction, joint finishing, etc., to ensure the production of a satisfactory end product.

Because of the very nature of the composition, it is ideally suitable for a multi-sport application.

Whereas most synthetic materials are designed and only suitable for one sport, or at the most, two sport applications, an E.M.A. type mix such as RUBKOR can be truly said to be multi-use.

By varying the percentage (by weight) of the elastomer additive, we immediately vary the resilience and elasticity of the final surface.

The direct result is that the material can be tailored to produce a surface of any specified resiliency which may be required by any particular sporting or recreational activity.

3. Properties

When compared with a typical synthetic material RUBKOR exhibits many similar properties:

3.1 it is completely self-healing after spike penetration.

3.2 It produces a resilient, elastic and "comfortable" surface.

3.3 It is non-slip when wet.

3.4 It is quiet to perform on, especially when compared with other common sports surfaces such as wood, concrete, asphalt, etc.

3.5 It exhibits a certain safety as it helps to prevent sport injuries.

3.6 It is classified as an all-weather surface.

4. Advantages

The RUBKOR E.M.A. type surface offers several advantages over the synthetic composition:

4.1 Economical to install.

4.2 Uses a high percentage of local materials.

4.3 Both the mixing and laying processes use basic techniques already available and no additional specialised equipment or skills are required.

4.4 Minimises the costs involved in importing, e.g. high freight costs, duty, tax, availability, etc.

4.5 A multiple sports use is obtainable from the same basic material.

4.6 Lower maintenance costs result directly from the conventional installation methods.

4.7 Easier maintenance methods result from conventional methods of application.

4.8 The very favourable initial installation cost makes this all-weather surface an attractive proposition for small towns, organisations, clubs, etc., which otherwise could not afford the luxury of a synthetic material.

5. Disadvantages

There are few direct disadvantages exhibited by E.M.A. mixes in general:

5.1 Because the material is thermo-plastic, its resilience varies to some degree with changes in temperature. In high temperatures it becomes more elastic and therefore slightly softer and possibly slower for some sports. In low temperatures the reverse occurs and the material becomes slightly firmer and therefore less resilient and comfortable.

5.2 The asphaltic composition of the material is considered by some athletes to be a disadvantage. This is mainly a psychological reaction as these athletes would feel that "if it is not fully synthetic it cannot be as good". In New Zealand, no evidence has been produced to support such a contention.

6. Selection of Resilience Levels

In 1975 when the E.M.A. material RUBKOR was first introduced into the sport and recreation scene in New Zealand, much of the information pertaining to the correct degree of elasticity required to give a satisfactory surface performance for each sport was obtained from Europe and the U.S.A.

Since then the results of tests and performances on early installations have resulted in modifications being made to the component material percentages to better suit local conditions.

In each case for each sport the final resilience is directly determined by the percentage (by weight) of the rubberised elastomer additive blended into the asphaltic concrete mix. In the various sports applications catered for to date, this percentage has ranged from 6% to 14%.

For the various formulations used, the weight of mineral aggregate percentage is varied to offset the alteration in elastomer percentage, while the hot bitumen remains constant at approximately 12%.

The proportions of the elastomer in RUBKOR for the various sports currently catered for are:

Cricket 6%, tennis 8%, gymnastics (sports hall) 8%, horse racing birdcages and walkways 8%, outdoor bowls 10%, athletics 12%, hockey and soccer fields 12%, and children's playgrounds 14%.

7. Surface Modifications to Basic Material

For many of the sports using this material, it provides the base or controlling layer and is then topped with some form of coloured, synthetic coating. The E.M.A. is still the critical layer in the surface system providing the resilience, comfort and desired athletic performance, but for aesthetic reasons, or sometimes to adjust its performance and durability, it is felt desirable to apply some form of topping layer.

Some brief examples are:

7.1 Cricket - a green, synthetic coating is applied to the surface to improve its appearance and effectively imitate grass.

7.2 Bowls - here a surface coating is applied to protect the bowl from damage, as well as providing the traditional "green".

7.3 Athletics - here the surface can be optionally surfaced by the application of a coloured, textured, synthetic topping.

7.4 Tennis - again, the addition of a one or two coloured coating improves the appearance and players' performance.

In most instances, the addition of a topping layer helps to reduce surface wear and therefore can be

termed a worthwhile addition to an elastomer-modified asphalt sport surface system.

8. Application to the Various Sports

Of all the sports surfaces where RUBKOR is used, cricket and outdoor bowls require the most critical formulation. Little variation from the ideal resilience can be allowed or the performance and playing characteristics of the surface will suffer.

In looking at the results and experience achieved with this material we will first deal with cricket and bowls.

8.1 Cricket

Since the first wicket installation in 1975 up to the present, there have been in excess of 80 match and practise wickets installed throughout New Zealand for clubs, schools, associations and local councils. Often the local council is responsible for the preparation and maintenance of natural turf cricket wickets in the various parks and reserves.

Several of these authorities have, over the past few years, adopted a policy of replacing their match wickets for lower grade games with an artificial type surface. In each case, an E.M.A. has been the choice.

Usually, the surface is installed over a reinforced concrete base which is often constructed by the body concerned, sometimes on a voluntary basis. One local authority responsible for organising the installation of several artificial match wickets over the past five years maintains that the capital cost of such an installation is approximately equal to the maintenance costs of a turf wicket for one season. As such, it is a good investment for any organisation.

The only maintenance required on the surface is a periodic recoating every two or three years, depending on concentration of use, with the green synthetic surface coating.

Now let us consider the playing characteristics of the RUBKOR surface.

For fast bowling the bounce is consistently around ball height. Only if the ball is deliberately

bounced off the surface does it rise above hip height. The line after pitching is very true.

For spin bowling the turn is acceptable and consistent, being similar to a natural turf wicket.

A prominent national cricket coach feels that the surface is very helpful to coaching, particularly to young cricketers, as the players soon gain confidence when batting on the uniform surface.

8.2 Outdoor Bowls

The development of an artificial surface for outdoor bowls has been comparatively recent. Very much a "natural turf" game, there has been considerable reluctance by many players to even acknowledge that their game can be successfully played on an artificial surface.

With the recent installation of several acceptable greens in New Zealand this reluctance is fast being dispelled with the result that in the next few years, many clubs are expected to install an artificial bowling green surface.

With bowls, the critical factor is to produce a surface with just the correct amount of resilience so that the bowl travels at a speed and draw acceptable to the majority of players. A speed between 16 and 18 seconds and the draw between two and 2.75 metres obtained on these artificial greens is very acceptable to bowlers.

The E.M.A. surface used for both cricket and bowls is covered with a coloured, rubber-filled synthetic coating. This coating is necessary to protect the ball and bowl from damage. This coating also provides a cooler and more athletically comfortable surface for the players. The speed and draw of the surface can be adjusted during the application of the colour coating, but these characteristics are mainly determined by the RUBKOR underlayer.

8.3 Athletics

It was to satisfy demands from this sport that the elastomer-modified asphalt surface was originally developed. RUBKOR was developed in the United States in the 1950's at the special request of the head coach and physical instructor of Boston University.

To overcome such discomforts as muscle soreness and bone jarring on the existing cinder surfaces, the development of a material was sought which would eliminate this and which would also permit continuous training under all climatic conditions. Further, the surface had to be virtually maintenance free and permit the continuous use of spiked shoes. This then was the beginning of the E.M.A. material, RUBKOR.

In New Zealand the development of RUBKOR surfaces for athletics is proceeding. Several long jump/triple jump runways together with two full track and field installations have been constructed.

The RUBKOR surface is excellent for continuous daily training as it does not cause the muscle injuries that are suffered by athletes who train continuously on a synthetic surface.

The advantage of an E.M.A. type surface compared with a fully synthetic facility is that it can be used on its own initially and then be upgraded later with the addition of a coloured granulated synthetic topping as finance and demand allows.

For athletics in particular, the E.M.A. material will satisfy a large number of organisations, particularly schools and clubs by providing a most acceptable all-weather surface at a realistic cost.

8.4 Tennis

RUBKOR provides a resilient, shock-absorbent surface for the tennis player. The material is normally overlaid with a coloured, synthetic topping to make it cooler and more pleasing to play on. The combination thus produced gives a bounce and court speed very similar to that of a grass court, yet without any of the many problems experienced with grass courts.

8.5 Gymnasium Flooring

The resilience required for gymnastics and other indoor hall sports is similar to tennis. The main consideration is the provision of a surface performance satisfying the multi-sport use to which a gymnasium floor is subjected.

8.6 Horse Racing

To date the use of the E.M.A. material within

the horse racing industry has been restricted to walkways and parade rings.

The main requirements for a suitable material are a resilient and yielding surface giving comfort to the horse and a non-slip surface which would lessen the extent and severity of injury to limbs in the event of a horse falling.

The installation of the first RUBKOR surface in the birdcage area at the Addington Raceway in Christchurch met the above criteria as well as giving an unexpected bonus to the controlling authority. The material was found to considerably deaden the sound of hoofs from the movement of horses around the area. The result was that the horses became quieter and calmer prior to a race than they had been in the past when parading on the hard asphalt surface.

8.7 Children's Playgrounds

In selecting the required resilience for a playground application different factors must be considered. Here the material must provide the maximum possible resiliency while still retaining sufficient strength and abrasive resistance within the overall composition to resist the wear and tear of foot traffic.

The incidence of injury to children using play equipment sited on hard, unyielding surfaces is surprisingly high. Therefore, in selecting the percentage of elastomer, we must endeavour to balance comfort and safety against acceptable wear properties.

9. Cost Examples (May 1981)

As the base construction, drainage and concrete kerbing requirements are similar regardless of the final surfacing material, the following tabulated costs apply to the all-weather surface layer only:

9.1 Cricket - $80m^2$ match wicket

	N.Z.
RUBKOR (E.M.A.)	$1,600
UNITURF (sheet synthetic rubber)	$6,500

9.2 Athletics - $5,000m^2$ track and field facility

RUBKOR (E.M.A.)	$90,000
TARTAN or CHEVRON (synthetic)	$450,000
RUBKOR - FASTRAC (E.M.A. with synthetic topping	$200,000

9.3 Gymnasium (sports hall) - 400m^2

RUBKOR (E.M.A.)	$9,000
ELASTATURF (Cast-in-situ synthetic)	$25,000
UNITURF (Precast sheet synthetic)	$30,000

9.4 Hockey - full field 5664m^2

RUBKOR (E.M.A.)	$120,000
ASTROTURF (synthetic grass)	$750,000

10. Uses Outside of the Sport and Recreation Field

Due to the very nature of the E.M.A. material and its adaptability, it has considerable potential for uses outside of the sport and recreation fields.

To date, little work has been done in this area. However, now that it has become well established and familiarity and experience with its mixing and laying characteristics have been gained by most of the asphalt manufacturers throughout the country, we can confidently expect to expand its uses in the future.

Some areas where it could ideally be used include:

resilient factory flooring, pathways in gardens and old people's rest homes, swimming pool surrounds, freezer floors and other industrial applications, to name but a few.

11. Overseas Uses

Since its introduction in the 1950's, the E.M.A. has been used extensively in Europe and North America for a multitude of different applications. Because of the large population in these areas there is a substantial amount of money available for sport and recreation facilities. This inevitably leads to the use of P.V.C. and polyurethane-based synthetics in some prestige athletics facilities. However, a significant area of RUBKOR surfacing is now installed throughout the world.

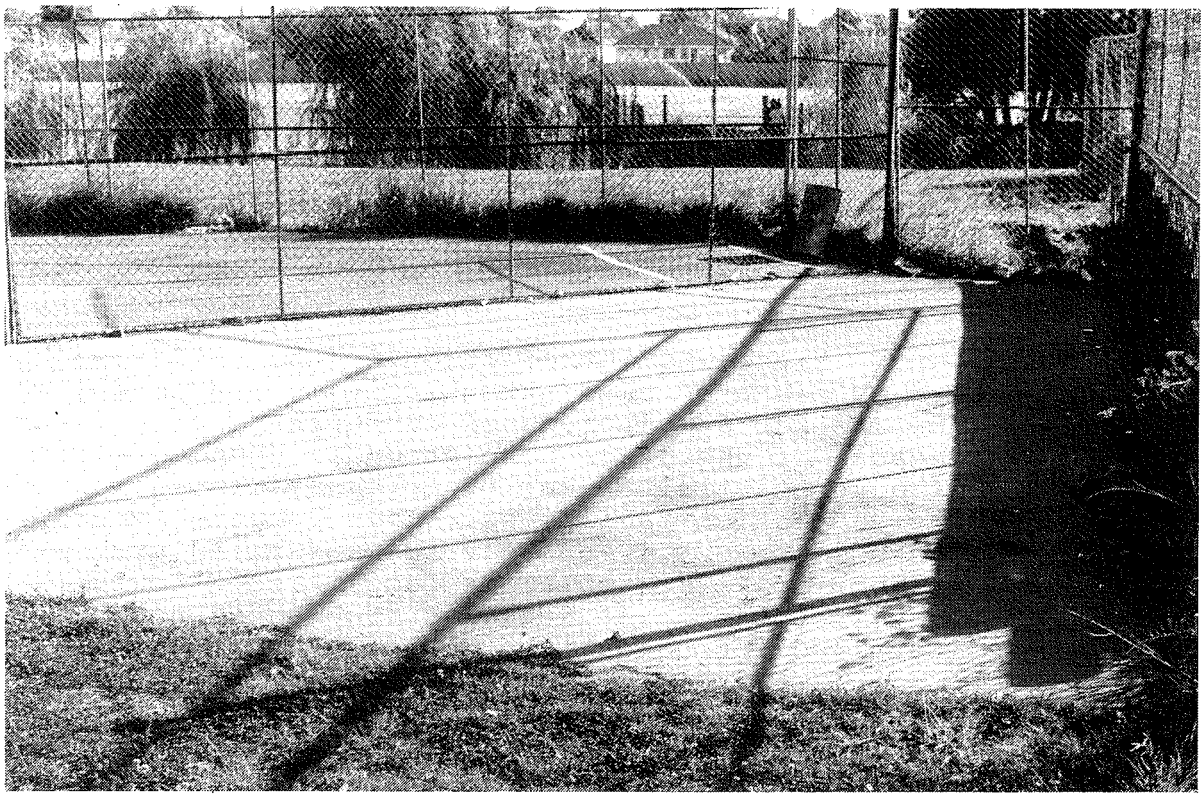
12. Conclusion

Perhaps the biggest single factor in the growth and use of the elastomer-modified asphalt in New Zealand is its economic value.

It has given asphalt producers the opportunity to diversify their operations and in doing so, use their expertise with asphalt plant, equipment and construction techniques.

Acknowledgement

The author would like to thank Pavroc Holdings Limited for the assistance given in the development of the material and for the opportunity to compile and present this paper.



Rubkor practise area for cricket, coloured pale green.

SUPREME COURT

P.C. Osborne

With the development of professional sport many athletes, particularly tennis players, are looking to any advantage to improve their game or gain equal footing; better racquets, footwear, or a court which suits their game.

With the money that can be made from televising tennis tournaments, many of these are now held indoors as they are not weather or light affected and the television picture is of even quality. Tournaments including Davis Cup, W.C.T. in Dallas, Volvo G.P., are now indoors and played on an accepted surface, i.e. Supreme Court. Indoors surfaces such as grass, clay or asphalt are not possible and concrete is generally not used in a multi-purpose hall although a wool store in New Zealand has been considered and is possibly satisfactory as long as other criteria are met. The most likely surface indoors is wood as generally the building is used extensively for a wide range of activities including sport. Wood is most favoured for public amenities, e.g. Madison Square Garden, New York, is used for tennis, ice skating, boxing, to name a few.

Practically all the men's indoor G.P. Tournaments are played on Supreme Court and this is slightly slower than Sporteeze which is used on the women's circuit.

1. An international tennis court is 120' long by 60' wide (imperial measurements are still used in preference to metric). As the actual playing surface is 78' x 36' this size of court gives 21' runbacks and 12' on each side.

2. Supreme Court is a 4 ply sandwich construction and consists of:

   (a) Face coat
   (b) Polypropylene nylon reinforcing fabric
   (c) PVC back sealing coat
   (d) PVC foam cushion backing

3. Supreme Court can be one colour for total area or a contrast for the playing area and a different colour for the surrounds. British Green, Brick Red, Scandinavian Blue, Tropical Blue and Island Sand.

4. It is a roll-sown sport surfacing suitable for either tennis or badminton and can be portable or installed permanently. A design for a temporary tennis post is also available.

5. The lines of the tennis court are marked on during manufacture and the total court is in five panels, each 120' x 12' = 1,440 sq. ft. The weight of each panel is 297kgs, approximately, and the total area weighs 1.5 tonnes.

   If a permanent installation the court is rolled out of the cardboard core, battened at one end and then carefully pulled straight and battened at the other end. The sides slightly overlap and are then cut by a carpet layer for exact fit. Adhesive tape is used under each side to hold the lengths firmly together.

   With a portable court three strips of a double backed tape are laid in rows under each end of the court and the procedure is then the same as for a permanent court.

   The final process is the use of a seam welder or seamsealer which is a PVC solvent for each of the joints and this forms a tight waterproof bond. The initial laying of a court takes two - three men up to a day, but subsequent laying should take about half a day.

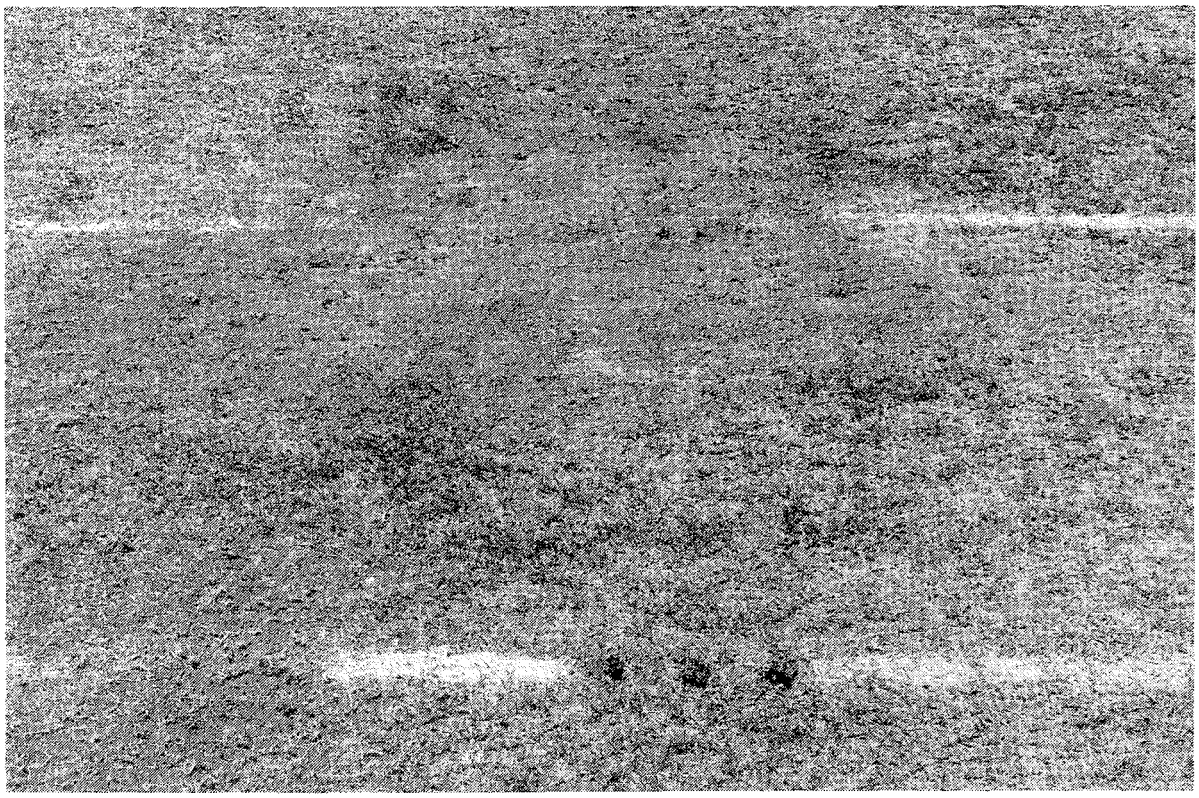
7. Current prices are one colour - N.Z. $2.20 sq.ft.
   two " - N.Z. $2.31 sq.ft.

   These prices are C.I.F. to a N.Z. port and represent a cost per court of $15,840 and $16,632 respectively.

8. Present locations in N.Z. for Supreme Court are: a four court permanent complex at the Wellington Indoor Tennis Centre, Evans Bay, Wellington, and a portable court at Auckland University.

One final point of interest is that being a manufactured surface, it is possible to vary the pace of the court to give a truly fast or slow bounce with variations in between. The 1979 Davis Cup final between U.S.A. and Italy was played in San Francisco on a Supreme Court manufactured to U.S. specifications which required a fast surface. The Italian team was used to the slow clay surfaces on the Continent and the result was a predictable 5-0 win to the U.S.

New Zealand is staging a Davis Cup Tie for the first time indoors in July in Christchurch at the Pioneer Stadium and this will be against England. As the top N.Z. players Chris Lewis and Onny Parun prefer as fast a surface as possible, the portable Supreme Court located as mentioned above at Auckland University, will be hired for use in the Christchurch Stadium.



Turf wicket after one weekend's play.

SOME CONSIDERATIONS FOR ALTERNATIVE SURFACES FOR OUTDOOR RECREATION

J.W. Bolton

Introduction

It has been said that the general requirements for alternative recreation surfaces are that they should be better or as good as grass or other conventional surfaces. To say this at such a gathering and, to those who deal entirely with the "Au Par Naturale" is perhaps asking for trouble, but I believe it is a good discussion point, and if it does raise the odd eyebrow, at least I have got you thinking. I would point out that I am not a salesman for any one particular surface, but just an enthusiastic believer that as a Local Authority we have a duty to investigate and install if at all possible, alternatives to turf. However, bearing in mind that artificial will never replace grass, and together with rising costs, and the availability of finance to maintain and develop turf being reduced, it is a question we must ask ourselves, "how far into the future can we continue?". I believe that as costs rise, we either reduce some of our turf areas and replace with artificial, or the price to sports clubs will rise to such an extent that only those on high incomes will be in a position to play. Alternatively, we obtain heavier subsidies from Central Government so that each and everyone of us can enjoy our sport. This in itself is an interesting question and again requires a lot of thought and consideration for the future if we are to maintain a healthy society".

A counter argument against what I have said is one of capital costs of providing the alternatives. Today many Local Authorities are not in a position to set aside considerable sums for capital development. This I will agree with, but if a policy or progression over a period of years

is adopted, then I believe it is possible for every Local Authority to participate in the provision of alternatives.

What are the alternatives and in what sporting areas can they be utilised?

At this point, I can only emphasise that I speak now of experience in what we have in Palmerston North. I confess I am not the expert and not technically qualified on the individual products, nor as I have stated previously am I a salesman, but one who is relatively enthusiastic in looking for the alternatives that will ultimately reduce maintenance costs.

Let me highlight one sport which causes the greatest degree of heartache, that is cricket. Because of the intensified preparation that this sport demands, we in Palmerston North, have now established ten wickets of alternative materials to turf:

(i) Uniturf
(ii) Rubkor

Uniturf

This material is a polyester type material laid on a concrete base. It comes in rolls approximately 1m wide and is glued to the concrete base. In this instance it was our first experience of using artificial materials for competitive play and so far it has more than proven itself. It is used exclusively for coaching younger players, and for women's cricket competitions, plus the heavy programme of twilight cricket which this City was instrumental in introducing with the advent of daylight saving. Admittedly, capital costs were high and I believe they are higher today, due to the material being imported at the time of laying ours, which was approximately four years ago. The cost was something in the order of $3,000 per completed wicket, which no doubt you will say is prohibitive, but bear in mind that once installed, the day to day maintenance and preparation is negative. All you do is arm yourself with a broom, bucket and mop and there is no rolling, cutting, marking or patching at the end of the game. Whilst on this point of patching, as yet we have not had this operation to carry out; luck perhaps.

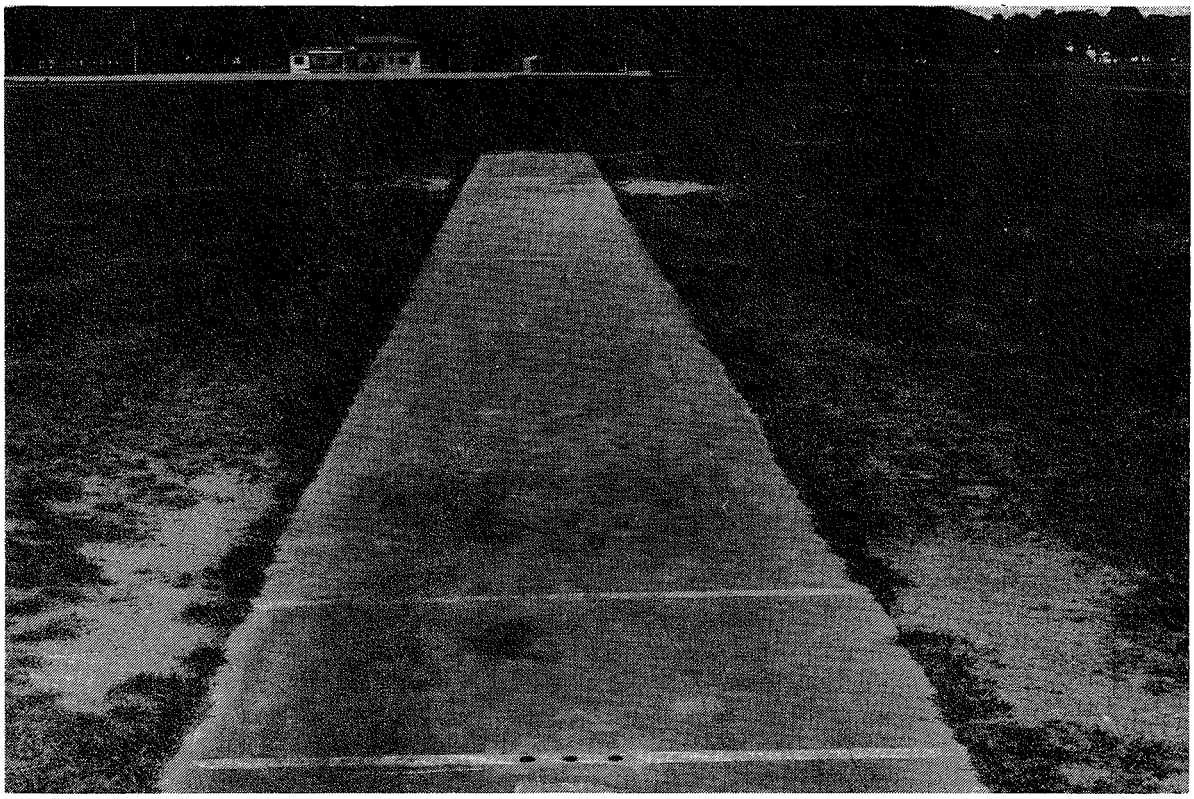
However, one day it will happen, some idiot will attack it with a knife or whatever, and if and when this happens, it will be a case of cutting out the injured area and re-gluing a new piece in its place, quote "the sales talk" unquote. I will believe this when it happens as I do not think it will be so easy. Not only will wear and damage occur from the vandal, but from the player. We have restricted the type of foot-wear to shoes with no sprigs (gym/road shoes or the like), thus the life expectancy will, I hope, be prolonged. No doubt this restriction is unpopular with many, but we have survived by making a firm policy from the outset.

At this point, I would admit there has been a reluctance on the part of the senior players to use the artificial surface as a competitive wicket on Saturdays. This is no doubt due to the fact that this type of surface does not suit what I term the funny bowlers or the spinners, etc., as they do not get any assistance whatsoever. I am pleased to say that for pre-season games the senior clubs do have a round-robin type competition, which at least gets them out of our hair, particularly, if the weather has been against us in preparing their grass wickets. It is this situation which commands and amplifies the use of alternative surfaces for this type of sport, because weather plays an important part in the preparation of turf wickets. At least they can play on the artificial surface if over-head conditions permit, and providing you treat them as such, they are a God sent answer to a groundman's life.

Disadvantages

The disadvantages are one, perhaps in the administration's eyes, two if you include the player. In dealing with the player, artificial surfaces do not play tricks like the turf. Because they are of a constant nature, the ball flies true. However, if the surface is damp, excitement of skidding players will occur. Outside this, all is fair in cricket. From the administrator's point of view, the big question is the siting. We are fortunate that all our wickets are situated between fields making a dry patch in the winter for the Mums and Dads watching their future "All Blacks" as they pound the turf into mud. On some parks we

Synthetic rubber laid on concrete.



Wearing and lifting of synthetic rubber on cricket wicket.

have sited them behind the goal posts in the dead-ball area.

This siting is essential. As you can appreciate they are of permanent material with a concrete base, and they cannot be shifted. I believe that we can all find suitable locations within our winter field situations.

Rubkor

We have in the City six wickets of this material. Basically it is a cork-rubber-bitumen mix, laid on a concrete base. By using a small footpath laying machine, one can complete the operation with no seams to trouble the bowler. In somewhat similar fashion to maintenance of a Uniturf wicket, a broom is really all the staff require to have the wicket ready for play. At this stage and without appearing to be accused of discrimination, I would say that this material has all signs of being perhaps not superior, but much easier to look after.

There will always be that person who will have a go at digging it out. With Rubkor, repairs would be similar to patching a footpath; again, we have not had to do any remedial work. Capital costs are much less; you still require the same in the concrete base, but the topping is considerably less. In our case, the total costs of material plus concrete was approximately $2,500 for two wickets, as compared with $3,000 for one with the Uniturf wicket.

One thing I have omitted to say is what width these tracks should be. Our first experience was by allowing a 1.8m wide strip by 33m long; this was our first mistake, so we have to live with it. Our next attempt was producing a 2.4m strip by 33.5m in length and this is the desirable length. It gives enough run up for the bowler and the 2.4m wide strip does not give the batsman the feeling of being confined. This is a very important feature if you play cricket. If you are not a cricketer, anything goes! Seriously, if you are not a cricketer, go for the maximum, which in my opinion starts at 2.4m. I feel the next series we put down I will recommend a 3m width and retaining the 33.5m length; this I believe is the ideal, despite the additional costs.

As a playing surface, it would appear that with Rubkor there is greater assistance to the bowler which makes their life a happier one. I would say, however, that we are more than satisfied with both surfaces, but would concede that because of costs, the Uniturf has, in my opinion, priced itself off the market. In all fairness to my Council, I could not recommend its use in the future, but in no way is this a criticism of the material as its use with us has proven invaluable.

You will note that I have not touched on or mentioned all-weather running tracks, etc. This in my opinion, is a separate issue, as I believe that our costs are centred around sports which provide facilities for a greater number of people. Because of this greater participation and with the future costs rising, and also our leisure time increasing, it will become increasingly important to consider facilities which are in the alternative range because grass will not withstand the constant pressure.

There are many sports in which, in my opinion, turf will always remain supreme, i.e. golf, cricket (first class) and above all, bowls, but it may well be that bowls can be played on artificial surfaces. We must all be aware of expense and do something to reduce our maintenance costs and avoid a situation developing where grass is only to walk on and not to play on.

No doubt there are other surfaces which are available, of which we have not had experience. This paper to you today is mainly to draw to your attention and make you realise that there are alternatives to turf. Rest assured, however, that your expertise will always be required as it has during the past one hundred years, because artificial will never totally replace the natural.

Softball-Skin Diamonds

We have now seen the more recent development of the use of a limestone or grit material for softball. I say softball, as we have placed a limestone material on trial as a substitute for turf in hockey goal mouths. However, due to its abrasive nature and unless players are fully clothed as they are in softball, some nasty skin damage will occur. This has necessitated us returning to the

soil situation, to me a pity, as at one stage I could see a great potential for limestone or fine grit. The only disadvantage of returning to the use of soil is that, as we all know, it returns to slush.

Basically, the development of the Skin Diamond has reasonably simple points to consider:

(i) Adequate supply of limestone, ground to a fine consistency. Top dressing quality is suitable.

(ii) First class drainage of the total area, not just the diamond.

(iii) Adequate personnel to maintain the area which requires grading and watering after and during use.

(iv) Provision of safety fences surrounding the diamond area.

In summary, it is important that when you are considering the installation of an alternative surface that you (the Local Authority), carry out the initial development, then you can dictate the terms of use, who is going to use it and when. If left to a local club, difficulties will arise as to when and how it will be used, and thus it is important that the Local Authority remains in control of the facility.

Finally, when considering the alternatives, do not get the impression that this is the end of your maintenance problems. It is not, but believe me it goes a long way in assisting. Without some alternatives such as the Skin Diamond, it would not be possible to prepare the softball diamond on grass, due to weather and to how the grounds have come through the winter. It is these circumstances which make the alternatives a valuable asset to any City and Parks Department, and to sport in general, this is of prime concern to us all.

INDOOR AND OUTDOOR SPORTS SURFACES

Notes provided by G.B. Clayton

With the world having completed the decade of the seventies and progressing into the eighties, the demand for sports facilities will continue to grow.

Due to this demand we find ourselves unable to meet the requirements with the sports surfaces that have been used in the past. These being wood for indoor sport facilities and grass for outdoor sport areas. With wood the supply has diminished and if available, the cost is normally prohibitive. With grass we face three problems:

(1) The cost to upkeep the grass, e.g. fertilisers, etc.

(2) The greenkeeper/groundsman appears to be a dying breed.

(3) The encroachment of one seasonal code into another seasonal code's time, therefore not allowing time for the facility to be prepared.

During the late sixties and all through the seventies, mankind has been developing artificial surfaces for sporting facilities. These differ from vinyl and rubber indoor surfaces to rubber and imitation grass for outdoor surfaces.

Polyflor Products (N.Z.) Ltd., has seen the growth in sporting facilities start to develop and due to this, undertook to find a range of first class sports surfaces for all occasions. We, as a Company, have been fortunate to establish ourselves as marketing and distribution agents for three leading European Companies. Each in their own right manufacture sport surfaces of differing natures. These Companies are Bat Taraflex, Mondo Rubber, and J.E. Adolf.

A brief resume' of the products manufactured by these Companies, and distributed by Polyflor Products (N.Z.) Ltd., are:

Bat Taraflex

These materials are manufactured in France and have been acclaimed worldwide for their outstanding qualities. Bat Taraflex have been official suppliers to the 1972, 1976, and 1980 Olympic Games as well as numerous other world sporting occasions.

Taraflex Sport

This is a textured vinyl with a rugged non-skid surface. The surface of this floor covering shows a deep grain with rounded tips. This material is supplied in sheets designed to be joined together by a thermoplastic welding process using a cord of similar material as the floor covering itself. This floor covering is specially designed for gymnasium floors. There are three types of Taraflex Sport floorings:

Taraflex Sport S is a homogeneous 2.2mm thick PVC sheet, textured with a non-slip surface.

Taraflex Sport M has the surface of the Sport S combined with a 4mm PVC closed cell foam-backing reinforced by a glass-fibre cloth. This combination allows flexibility, suppleness and dimensional stability.

Taraflex Sport MM is a recent material. Its upper surface is still a homogeneous 2.2mm PVC layer, but with a much smoother non-slip texture. It has a double PVC closed cell foam-backing (6.6mm thick) of high density reinforced by a glass-fibre cloth. It's performances makes it a high competition type of floor with remarkable resilience.

All Taraflex Sport Surfaces are 'Sanitized'.

Mondo Rubber

There materials are manufactured in Italy. Again, Mondo Rubber were official suppliers to the 1972, 1976 and 1980 Olympic Games for both indoor and outdoor sports materials. Mondo Rubber have

more than 25 years' experience in the field of athletic and sports floors. Some advantages of a Mondo Rubber sports floor are:

Homogeneous construction, correct degree of resilience to avoid muscular strain or fatigue, unaffected by cigarette burns and ease of maintenance in that no sealers or polishes are to be used.

Three of the Mondo Sport range are:

Indoorflex - Special rubber flooring for: sports halls, swimming pools, gymnasia, and community centres. Indoorflex is absolutely odourless, non-slip, anti-bacterial, non-reflecting, resistant to cigarette burns and with considerable acoustic absorption. It is a polyvalent with special characteristics which make it possible to play all indoor sports or activities on a surface that helps the performance, particularly for clubs and schools. Suitable for swimming pool surrounds and other areas for changing and showers.

Mondoflex - Rubber floor for sports hall and gymnasia with a matt finish, non-slip surface. This was the typical floor for a school gymnasium, with the advent of sports halls and martial arts ancillary rooms, it has great application for the sports hall, the Olympic gymnastic areas, the judo and martial arts room and the physical conditioning room.

Sportsflex Super X - Rubber surface with polychloroprene for outdoor sport installations: athletic tracks, run-up and take-off areas for jumps and throws, Play areas where short spikes or cleats are fitted to the soles of shoes or boots, or walkways from playing area, cricket fields or golf club-house. Although prepared as an outdoor surface, will serve similar purpose indoors if required. The controlled resilience offers the athlete the ideal track surface, returning the forward thrust from "drive". The "relief" graining makes the surface non-slip even in wet conditions. There is little or no abrasion from body contact with the surface which resists damage from spikes or cleats, is easily cleaned and has low maintenance cost; is not affected by point

loading or lighted cigarettes. Makes sense for areas, outdoors and indoors, where players will be wearing shoes or boots with cleats or spikes.

J.E. Adolf

This Company in West Germany manufactures the world renowned ranges of synthetic grass marketed under the name of Poligras.

Poligras was originally designed to provide all-year round facilities for soccer played on the Continent. Today, Poligras is available in a range of grades to suit all sports. It has been widely used for indoor sports halls where varied training programmes call for constant changes of playing performance; tennis to soccer, hockey to cricket, and so on.

Similarly, Poligras has been installed in outdoor locations in a variety of ways, from simple and economic cricket wickets to football pitches with an underheating system to counter winter snow and ice.

Poligras is either a polyester or polypropylene surface melted to a PVC backing. Various grades of surface are achieved by the depth of pile, and its denseness. The extra advantages of permeability for outdoor use is provided by integral drainage matting; a major feature which gives durability and ideal playing conditions whatever the weather.

Poligras needs no adhesives. It is simply stretched and held firm at the edges. Each strip is two metres wide and stitched in a butt seam to prevent unusual ball bounce.

The permeable grade of Poligras has maximum rot-resistant qualities plus resistance to ultra-violet light, which means no unpleasant bleaching out in sunlight.

Poligras Hockey was chosen as the material for the hockey stadium at the 1980 Moscow Olympics. Two of its greatest advantages over competitors' products are:

(1) being the only totally porous synthetic grass available in the world today, it does not require a crowned base thereby keeping intact the intrinsic playing characteristics of the major ball sports.

(2) being manufactured of polyester and polypropylene fibres it does not experience the problems of its nylon competitors in that it resists rotting and ultra violet light from the sun's rays.

Sportflex for Tennis Courts Outdoors

Sportflex 6mm for Tennis, Basketball or Volleyball is a homogeneous natural rubber with polychloroprene; calendered and vulcanised with mineral additives, stabilising agents and pigmentation in Red, Beige, Green and Yellow.

Width of sheets are standard between 1m and 1.50m. The standard length is up to 18.40m.

The surface is a sealskin finish to give the right traction and slide for tennis and the other sports named.

Will not withstand the use of spikes or cleats as does Sportflex Super X for athletic tracks. Must be restricted to play with flat soles or bare feet.

Classification DIN.51.960, difficult to burn and holds Health and Hygiene Certificate dated 1 January 1975, signed in London. Recoil Test Shopper Pendulum 21.21.21. for Tennis excellent.

Artificial Cricket Wickets

Due to the spiralling costs and climatic conditions there have been studies carried out in the United Kingdom to find products suitable to practise and play cricket on.

These studies and experiments have been carried out during the last ten years or so. There are now one thousand installations in the United Kingdom where an artificial product has been used. Most of these installations are at schools throughout the United Kingdom. However, in the last two years, County Cricket Associations are installing match wickets for practise purposes. Two such County Associations that have installed artificial surfaces are Nottinghamshire and Worcestershire.

In the United Kingdom, it has become common practice for the schools to install an artificial cricket wicket over a bitumen sub-base in the middle of the soccer or rugby playing field. In the winter they lift the artificial surface and replace sods of soil over the bitumen. This overcomes the problem that groundsmen experience from one change of sport to another.

Three types of artificial cricket wickets are marketed by Polyflor Products (N.Z.) Ltd., in New Zealand. They are Poligras Jubilee, Truturf, and Truturf Special.

Poligras Jubilee

Poligras Jubilee is a synthetic grass product which is rapidly being accepted by cricketers for use in both practise and, indeed, match wickets. Unlike other materials, Jubilee is not loose laid, but fixed at the edges, thus there has been eliminated two major problems which other synthetic cricket wicket surfaces suffer from, in that they use no adhesive and the material is not loose laid and therefore is theft resistant.

Poligras Jubilee is supplied in rolls either 2m wide or 4m wide. The 2m wide rolls (6'6") are ideal where a 6' wicket is to be produced. Laying is simple; one simply lays out the Poligras on a concrete or bitumen base and because there is a 75mm (3") overlap on each edge, one can use this

overlap to fix the Poligras Jubilee firmly to the edge of the concrete or bitumen base. When fixing, it is necessary to tension the material across the base merely by pulling by hand. The same method is employed at the ends of the base. The turf is then returned up to the edge of the wicket and once established it stops prying fingers getting at the fixings.

The 4m wide rolls of Poligras are used to produce wickets of a greater width than 6'.

We do not recommend that spikes are used on Poligras Jubilee because obviously spikes will cut down the life expectancy of any synthetic material, but with the general trend of cricketers going for the new type of moulded sole on their boots, this is no problem. Therefore, because Poligras is loose laid it is possible, in years to come, to cut the wicket in the centre and by reversing the two pieces, one can put the worn stanced end to the centre of the wicket thereby renewing its life.

Players enjoy the consistent stump high bounce with all the lift, spin and movement of the ball that provides equal test for batsmen and bowler.

Truturf and Truturf Special

The difference between these two materials is that Truturf is for indoor installations only whereas Truturf Special can be installed either indoor or outdoor.

They are a textured porous carpet that is adhered to a porous sub-base. Because they are porous when used outdoors, the wicket can have a greater intensity of use and the surface conditions will remain stable in variable climatic conditions.

Truturf Special can be installed in existing cricket pitches and the edges of the wicket are integrated into the existing turf in such a way that they do not interfere with the playing of the wicket.

Ray Illingworth, the former MCC cricket player, makes these comments about Truturf Special: "It has a natural bounce. It's the nearest thing to turf that I've played on. It is better for the younger players than poor grass wickets, because the accuracy of the ball reaction is ensured".

NOTES ON PLANNING OF PARKS AND CHILDREN'S PLAYGROUNDS

G.W. Lucking

Parks

A relevant approach for the 80's.

1. The need to appreciate that they do not exist solely for organised sport.

2. Parks form an important part of the open/ green space pattern.

3. They need to have a sense of place.

4. They need to be landscaped to assist achieving 3.

5. One of the few remaining places in the suburban scene where there can be large trees.

Children's Playgrounds

1. The importance of unorganised, free, creative play in a child's development.

   We live in an organised society
   Gross and fine motor skills
   Cognition
   Initiative
   Concentration

   Preparation for older life and retirement begins here.

2. Careful selection of site.

3. Need to involve local community including children in planning.

4. It is a child's playground - not an adult's concept of child's play or an adult ego trip.

5. Need to provide for the following wherever possible.

   Climbing
   Balancing
   Crawling through
   Jumping
   Moving through space
   Digging
   View from height
   Sand and water play

6. Should be a place to sit in
   a special place
   a place to be quiet
   provision for sand and water play
   built in seats and tables
   provision for painting and display of same
   tree or trees

7. Need for theme
   simplicity
   sense of place
   a certain intimacy

8. Provision for disabled.

9. Adventure playground (junk-type playground).

10. Playleaders.

11. Safety.

12. Surfaces.

Children's Playground Surfaces

To provide surface or surfaces which will:

1. Stand heavy wear.

2. Allow all year round and/or all weather activities.

3. Ease of movement (where applicable) for disabled children - e.g. wheelchair use.

4. Provide resilient surface in case of fall.

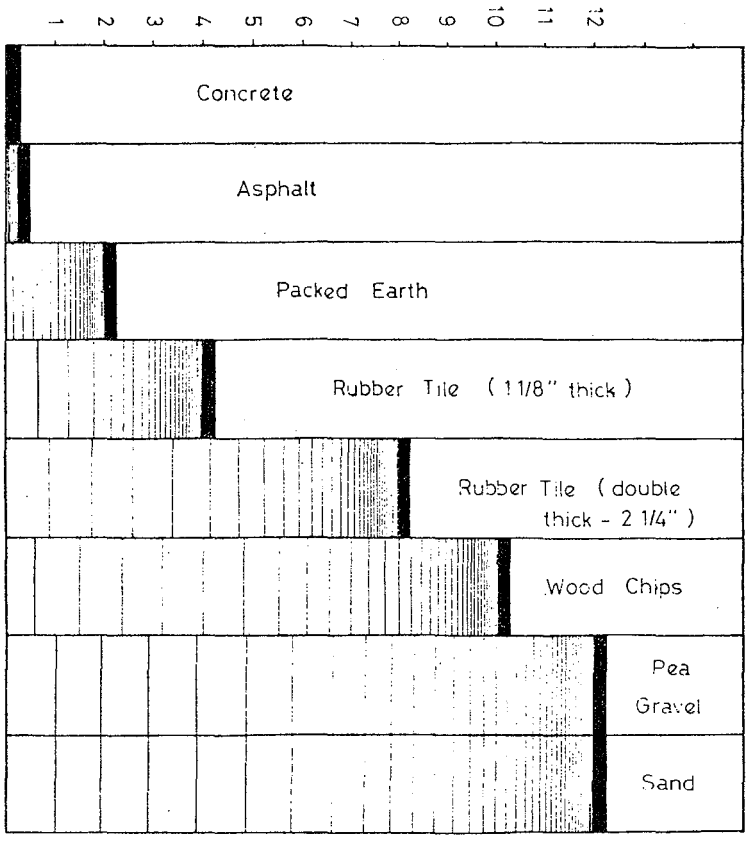
5. Provide a variety of tactile experiences.

6. Provide grip or traction.

The table below shows the accident cause related to age groups.

CAUSE OF ACCIDENTS / AGE GROUP	FELL OFF		HIT BY		OTHERS		TOTALS	
	No.	%	No.	%	No.	%	No.	%
0-4	12	6·9	17	9·8	1	06	30	17·3
4-6	24	13·9	9	5·2	3	1·7	36	20·8
6-8	19	11·0	10	5·8	3	1·7	32	18·5
8-12	30	17·3	13	7·5	5	2·9	48	27·7
12-16	16	9·3	6	3·5	5	2·9	27	15·7
TOTALS	101	58·4	55	31·8	17	9·8	173	100

At least 50% of accidents terminate in some form of ground surface impact. Sponge rubber matting (e.g. as used for high jumping) is not practical in most cases because of high wear and vandalism. Proprietary resilient surfaces also fall into the same category and are expensive. Their effectiveness is also limited as the following table shows:



An interesting guide which shows the height in feet to give an impact force of 50g's (projected from test data). Impact with the ground is a common occurance in playgrounds and it is obvious from this guide that very serious consideration must be given to the type of surface which is laid in these areas.

(From Parks and Sports Grounds, Vol. 43, No. 6, 1978.)

SURFACING MATERIALS FOR CHILDREN'S PLAYGROUNDS

The cost of asphaltic concrete (on stabilised base) and concrete taken as average and costs graded in relationship to this -

Cheap
Average
Fairly expensive
Expensive
Very expensive

Material	Position	Advantages	Disadvantages
Grass Cost, average.	Generally	Pleasant appearance, reasonably resilient, manipulative.	Won't stand heavy use. Becomes muddy when wet. Inhibit use by disabled when wet. Wear and use can be improved with proper drainage, but this is expensive.
Packed earth. Cost, cheap.	Generally		High erosion, muddy when wet, dusty when dry.
Stabilised earth (plus cement, very good). Cost, relatively cheap.	Paths around equipment.	Stands reasonably hard wear. All weather use. Easy to repair. Allows free movement. Manipulative.	Hard, harsh appearance.

Material	Position	Advantages	Disadvantages
Concrete Cost, average.	Paths. General play area.	All weather use. Hard wearing. Allow ease of movement. Reasonably manipulative. Can be trowelled to very smooth surface for sliding.	Hard. Uncompromising appearance Glare factor. Hard on children who must crawl or slide.
Asphaltic concrete on base course. Cost average.	Paths. General play area.	All weather use. More resilient than concrete. Slightly better appearance than concrete. Allows ease of movement. Hard wearing. Can be coloured, but then expensive.	Absorbs heat from sun.
Chip seal on base course. Cost, cheaper than asphaltic concrete.	Paths. General play area.	Stands reasonably hard wear. All weather use.	Abrasive, unsuitable for children who must crawl or slide. Soft in hot sun. Requires periodic maintenance.
Cobbles Cost, expensive.	Climbing mounds.	All weather use. Hardwearing. Provides good traction. Manipulative. Interesting appearance and texture.	Hard, unyielding surface.

Material	Position	Advantages	Disadvantages
Bricks and brick pavers. Cost, expensive.	Paths. General play area. Special areas.	All weather use. Good appearance. Can create interesting patterns. Hard wearing. Reasonably manipulative. Can be used to define special areas.	Weeds grow in joints unless mortared. Will encourage moss growth unless in full sun. Impedes movement if irregularly laid.
Concrete paving stones 'Sets'. Cost, expensive.	Paths. Special areas.	All weather use. As for bricks.	As for bricks.
Pea Gravel Cost, relatively cheap.	Under equipment.	Resilient. Interesting to play in/ with.	Nuisance value as children can throw it or cart it away. Easily fouled.
Sand Cost, relatively cheap.	ditto	ditto	ditto
Boarding Cost, expensive	Paths. Special areas.	Interesting texture, pattern, appearance. All weather use. Hard wearing. Relatively warm to sit on.	Can impede movement if laid irregularly.

Material	Position	Advantage	Disadvantages
Log section pavers. Cost, expensive.	Paths, Special areas.	Interesting texture, pattern, appearance. All weather use. Hard wearing. Relatively warm to sit on.	Can impede movement if laid irregularly.
Water Inexpensive in itself, but containment expensive.	Special areas.	Requires to be contained. Evaporates. Can be fouled. Requires replacement or filtering.	
Bark Chip Relatively cheap.	Under equipment.	Resilient. Allow good drainage. Warm.	Impedes movement of disabled. Easily fouled.
Astra Turf Very expensive.	General play areas.	Resilient, pleasant to walk on. Pleasant appearance.	High wear. Subject to vandalism; hence, high maintenance.
Rub-Kor rubberised asphalt. Expensive.	General play areas.	Relatively resilient. Can be coloured (then more expensive).	
Elasta-turf Very expensive.	General play areas.	Relatively resilient. Can have pigment added (more expensive) or applied colour.	Surfacing only. Subject to vandalism; hence, high maintenance.

THE PIONEER SPORTS STADIUM

PARKS AND RECREATION DEPARTMENT

CHRISTCHURCH CITY COUNCIL

Notes prepared for participants attending the course

by

P.W. McOscar, Recreation Officer in Charge.

1. Staffing

Stadium Supervisor - Recreation Officer in Charge

Responsible for day to day operation, staff supervision and rostering, recreation programming, general stadium bookings. Also takes part in recreation programme tuition/supervision.

Recreation Programmes - Recreation Officer

Assists senior officer, but basically involved in community recreation programme.

Maintenance

Custodian/Cleaner - Day to day cleaning and building maintenance.

Casual Cleaners 2 - Assist with cleaning during weekends or on a casual basis.

Reception - Cashiers

Seven part-timers to cover a 20 shift roster over seven days. Hours generally between 9.00am and 10.30pm. Monday to Friday (no shift Saturday evening). Generally involved in squash bookings, fees collection and recording programme attendance registers.

Community Recreation Programme - Casual Tutors

Some 15 persons with specialist skills supplement the two permanent Recreation Officers, during each week the recreation programme operates.

2. Utilisation of Facility: (Can be grouped in five sections)

i.e. Indoor Basketball
Indoor Soccer
Indoor Cricket
Volleyball

Indoor Netball
Indoor Tennis
Badminton
Indoor Bowls

Community Recreation Programmes

2.1 Housewives - badminton, basketball, keep fit, yoga, squash, etc.

2.2 Adults' evening programmes - dance classes, squash, keep fit, badminton, etc.

2.3 After school children's programmes - gymnastics, squash, racketball, games sessions, etc.

Primary, Intermediate, Secondary School Hires

Class, school club, inter-school use, mainly badminton, basketball, volleyball.

Casual Community Hires

Squash, badminton courts, use by individual, church and youth groups, family units, etc.

Major Social or Commercial Hires

Custom car shows, trade displays, banquets, reunions, celebrations, dog shows, etc.

3. Pioneer - Analysis of Facility

Sports Hall

Floor

Surface:	Rimu, tongue and groove. Laid on timber bearers, set on concrete piles. Floor surface polyurethaned.
Suitability:	Extremely suitable for original purpose. With increased demand for events other than conventional indoor sports; floor showing signs of abuse through non-compatible uses.
Maintenance:	Dust mopped with static mop (generally each morning). Mop impregnated with a perfumed floor oil - assists in breakdown of body fats and dust collection. Approximately six litres of floor oil used each year.
Safety:	Providing oil application not too heavy, surface generally not slippery. Spilt liquids create hazardous/slippery conditions.
Note:	After major functions "hirer" required to employ cleaning contractor. Cleaning method - hot water/detergent, wash and scrub. Then dried and buffed. Buffing done on low R.P.M. to ensure surface not made too slippery.

Walls

Construction:	Stadium wall construction consists of lower area concrete block. Upper area galvanised iron long run cladding. Fixed to steel cross-girders. Ceiling lined with fibreglass epoxy resin surfaced batts set in aluminium frame/ fixings.
Suitability:	Block walls ideal. Height ensures uncontrolled balls, etc., strike this area. Used as play wall and perfect for fixing sports apparatus to. Galvanised cladding prone to disturbance through the grips of fixing clips being

broken by forcefully kicked balls. Ceiling batts prone to being dislodged.

Maintenance: Practically nil, apart from yearly dusting.

Note: Sports hall contains no windows or deflected window light panels. All light provided by electric power. Other department facility troubled by broken windows (vandalism) or direct sunshine interferring with players' movements. Pioneer's sports hall can be extremely cold in mid-winter and the reverse in summer.

4. Squash Centre

Floor

Surface: Similar to sports hall. Floor surface not polyurethaned, but stained.

Suitability: Excellent except stain. Recommend nail holes be filled, floor sanded for levelness, but no surface application be applied.

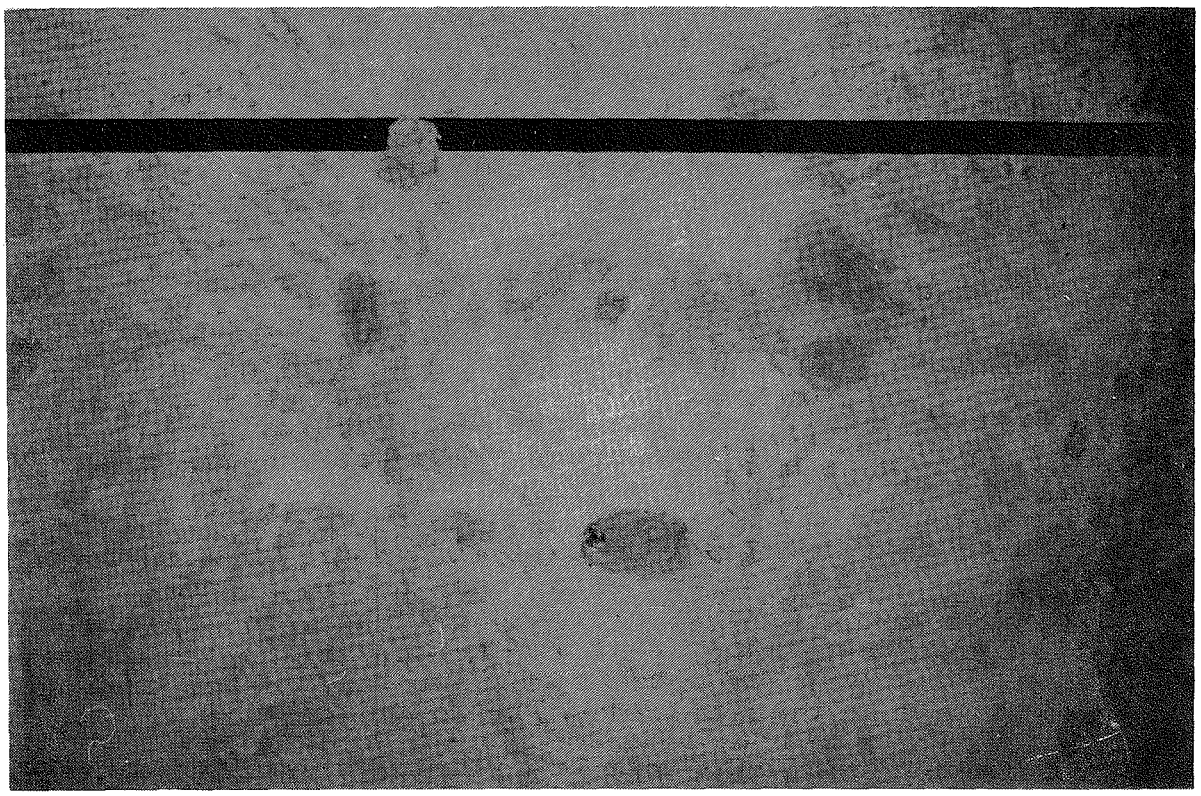
Note: To assist with court ventilation floor should go to within 5-10mm of walls.

Walls

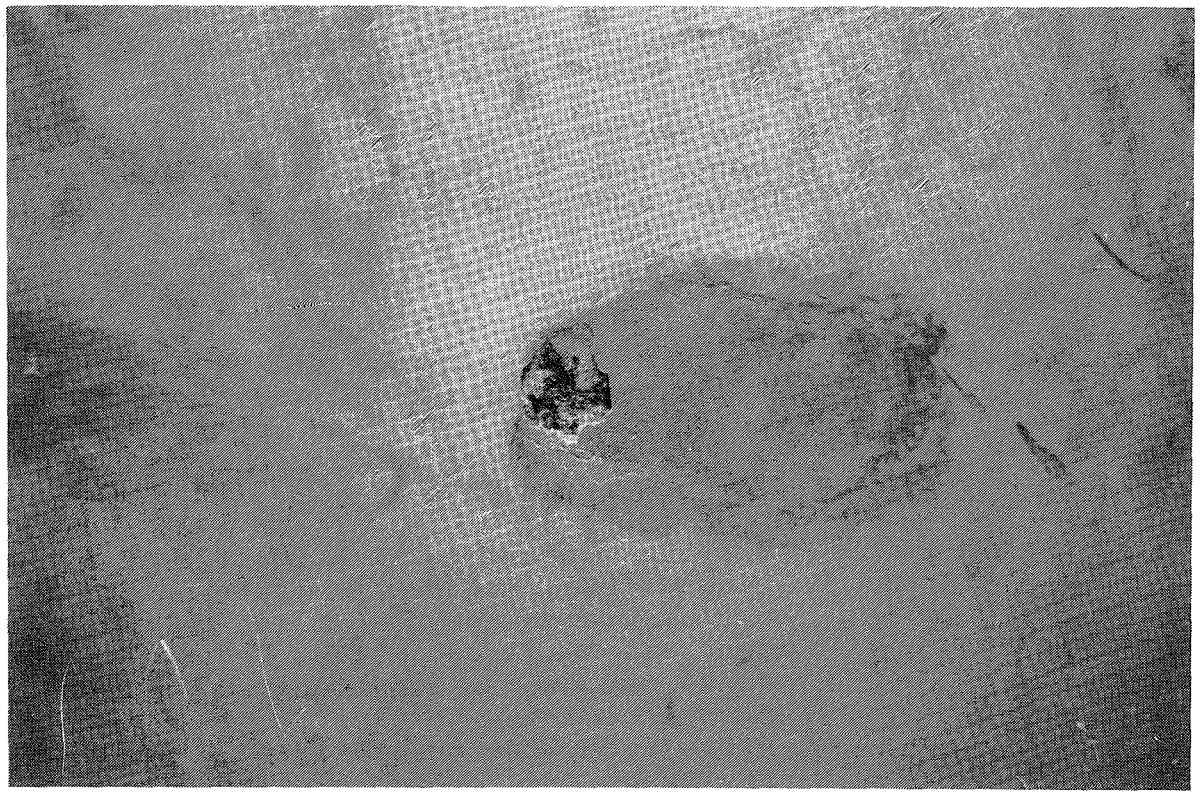
Construction: Plaster over block veneer. (Personal preference for lift slab concrete i.e. no maintenance.) Plaster surface may tend to break up requiring patching. Never completely satisfactory. Playing surfaces liable to general cracking. Whitening impregnated in plaster; does not give a clear white surface, slightly patchy.

Ceiling: Same ceiling arrangement as for sports hall. Not suitable for squash centre as balls striking roof are destroying batts' outer surface. Hung to reduce noise.

Maintenance: Floor surface, dry swept with occasional hot water detergent washes. Wall areas



Pre-cut concrete squash court back wall showing failure of white sand-cement plaster. *(Refer P.54 and P.84.)*



cleaned on a yearly basis. This removes 95% of body grease/sweat, ball/racket marks, etc.

Note: Some problems occur mid-summer through inadequate ventilation. Heavy body odour occurs during peak use times.

5. Changing Facilities

Floor

Surface: Area adjacent showers, toilets and change areas are a heavy commercial grade vinyl.

Suitability: Ideal if well maintained as a surface covering for main thoroughfares. If surface highly polished, not suitable for areas where there is a likelihood of water being spilled. Water creates a hazardous, slippery surface.

Safety: This floor covering is adjacent urinals, showers and under hand wash basins. Water is continually spilt from these facilities, creating extremely slippery conditions. Non-slip mats recommended.

Note: The height of the seating and clothing benches is fractionally too low to allow most commercial polishers under.

Walls

Construction: Block reinforced outer walls, internal walls combination of plaster or chip-board cladding. Ceiling consists of long run concrete girder forming base for upper floor.

Maintenance: Problems occurring with mould on south side of building due to condensation and damp atmosphere settling on cold concrete surfaces. Paint beginning to flake off shower area roofing surfaces. Annual cleaning to clear mould growth. Areas otherwise generally only require dry sweep and detergent/disinfectant

hot wash.

Shower/Toilet Cubicles

Walls: Cubicles are divided by formica laminex panels.

Maintenance: Easy to maintain, but shower panels require heavy maintenance programme to reduce levels of body grease/fats, etc. This also applies to shower trays. Light colourings show dirt marks, etc., too easily. Proprietary cleaning liquids used.

Safety: As facility open to public staff must ensure high standard of cleanliness in shower, toilet/urinal facilities.

Note: A commercial urinal bacterial/ deodorant and water flush system was installed recently. Vast improvement in reducing urinal odours and reduction in water usage.

6. Entry Foyer

Floor

Surface: Same heavy duty commercial grade vinyl as used in other parts of stadium.

Suitability: Ideal, relatively easy to maintain. Does suffer from cigarette burn marks easily.

Maintenance: Daily sweeping and buffing by vacuum/ machine polisher. Proprietary brand buffing liquid applied by spray regularly. Floor polish applied infrequently.

Walls/Ceiling: Most internal walls reinforced concrete block. Maintenance practically nil. Ceiling long run concrete girders acting as floor base for upper floor. All surfaces painted.

Note: With all solid surfaces in this area problems of noise reverberation when large numbers of stadium users pass through foyer.

ARTIFICIAL ICE

The "Skate All" nonrefrigerated polymer plastic skating systems have been developed and tested to provide carefree ice-oriented recreational and commercial facilities either outdoors or indoors.

Advantages of both the indoor and outdoor surfaces include portability, ease of installation, no skilled labour needed to install or maintain, any smooth surface of any size can provide rink facilities, and no compressors, pipes or refrigerants are needed to maintain the ice-like surface.

Skate All consists of interlocking 60cm by 60cm squares, 0.64cm thick, that fit snugly together to provide a smooth surface to skate on. The outside surface material contains special inhibitors that make it impervious to weather conditions in all climates. The inside surface is designed specifically for under-roof skating.

Skate All is ideal for hockey, ice shows, ice sporting events, recreational skating, shopping centre promotions, and special events.

The Skate All surface is approximately 90 percent as fast as refrigerated ice, maintains a constant efficiency, can be used year round with regular ice skates.

The new outside surface, now available for the first time, eliminates the need for expensive heavy machinery and can be easily shipped. The outside surface is unaffected by climate almost anywhere in the world.

(N.Z. Agents; Demden Industries Ltd., P.O. Box 704, Tauranga.)

NATURAL VERSUS ARTIFICIAL TURF

W.B. Davis

Extract from Sports Turf Review, N.Z. Institute for Turf Culture, No. 131, 1981.

Throughout the United States, many of our major league sports stadiums have switched to artificial turf. Monsanto's 'Astroturf' is the most popular one. Some of these stadiums are completely indoors like the Astrodome in Houston, Texas; others are partly covered, which makes artificial turf the only choice. Several major stadiums are now returning to natural turf with various modifications of a sand base growing medium. The reasons for returning to natural turf vary. Now that we have several years of experience with both artificial and the new sand concept for natural turf, we can better judge the pros and cons of each system.

Artificial turf has two major advantages:

1. The field can be extensively used, moving from one sport or activity to another, with a minimum chance of reducing its useful life over a five - seven year period.

2. Annual maintenance costs are lower, and it requires a less technically trained management team. (But its management cannot be considered "low maintenance", particularly when compared with the type of average to low maintenance budgets many natural turf managers have worked with in the past.)

There are several arguments in favour of the newer sand-based natural turf athletic areas:

1. Construction cost of a sand-based field, even if it includes a closed cell system, ranges between one third to one-half that of an artificial turf. For many fields where a non-cell system has been used, the difference in cost is even greater.

2. Serious vandalism to natural turf, particularly the new sand-base fields, can be repaired at considerably less cost than for artificial turf.

3. Total football injuries both minor and serious are 32 percent less on natural turf. When you look at only the very serious types of injuries, it makes little difference what type of surface football is played on.

4. Survey results show that 84 percent of the professional football players prefer natural turf.

5. Natural turf does not generate uncomfortable amounts of heat. In one study test made in October at noon when the ambient air temperature was 78°F showed the surface temperatures between bluegrass and artificial turf to be as follows:

Artificial Turf	125°F	(+46°F above air temperature)
Bluegrass ½" tall	83°F	(+15°F above air temperature)
Bluegrass 1½" tall	79°F	(+ 1°F above air temperature)
Bluegrass 4" tall	67°F	(-11°F below air temperature)

In most of California it is this heat problem which makes natural turf the first choice even when old soil construction methods are used.

CRUSHED LIMESTONE ALL WEATHER SOFTBALL DIAMONDS

Kevin Fogarty

Introduction

Softball Diamonds, including basic grass diamonds, have been constructed in clay, cinder, synthetic or crushed limestone.

For softball, the playing surface is all important. It must be firm enough to give good footing for the players, but soft enough to slide on without damaging their knees and elbows. Grass, clay and cinder diamonds meet both criteria provided they remain dry. The synthetic surfaces give excellent footing, but are expensive and are totally unacceptable for effective sliding.

Because of New Zealand's climate we cannot rely on the surface remaining dry and so, a further quality is necessary to allow all weather use, namely, the ability to allow the dissipation of surface water without affecting the playing surface.

Because the granular surface necessary for sliding prohibits flow across the surface, a permeable material is necessary to allow surface water to run away through it to a lower level.

There is obviously a limited number of materials that satisfy all these criteria. When we look further to questions of availability and economics there is only one: crushed limestone.

Siting and Setting Out

Obviously, the limestone area is a permanent fixture that cannot be incorporated in the normally turf surfaced playing fields for other sports during the off season. Thus, careful consideration as to the best place to site the diamond is necessary. Points to consider are:

- compatability with other sports fields,
- suitability for spectators as major games will be played on it,
- the possibility of fencing to enable gate charges,
- a suitable storm water out-fall is required at least half a metre below ground level,
- minimum disruption to other sports during construction,
- suitable access for trucks to minimise damage to parkland,
- sufficient room for a full international out-field.

Accurate setting out is essential and this is best carried out by an experienced surveyor.

Excavation

Excavation will vary with the drainage pattern and construction depth used. Careful trimming of the subgrade to the required falls is necessary. An excavator and a light dozer working to cut pegs at 5m grids were used at the Papanui Diamond. To ensure a neat transition from the lime area to the surrounding grass, the edge of the excavated area needs to be carefully maintained during each facet of the construction. Some of the topsoil removed will need to be stockpiled and used to restore adjacent grass areas upon completion.

Drainage

The drainage pattern will be dependant on the type of subgrade on which the diamond is being constructed. An impermeable subgrade such as clay will require a more extensive system than a well drained subgrade such as sand or gravel.

The Papanui Diamond was built in an area of heavy topsoil of approximately 300mm depth with yellow clay below. The drainage system used consisted of 50mm PVC perforated draincoil laid at three metre centres parallel to the centre line of the diamond. These were run into 90mm PVC storm water pipe which led to a concrete sump with a steel top buried 300mm below the surface. A 110mm storm water pipe was then laid to the out-fall in an open drain across the other side of the park. All pipes within the diamond area were laid below subgrade

level; (see cross-section on plan) and bedded in 12mm crushed chip.

Filter Layer

The filter layer specified for the Papanui Diamond was NRBF2 Filter Sand. A naturally occuring sand, Birdlings Flat Sand, was sufficiently close to the required grading to warrant its use especially as it was only half the cost of the equivalent manufactured sand. This material is a uniformly graded, no fines material of rounded particles and, as such, is difficult to work. The sand was dumped around the edges of the excavation and spread with a light dozer. A lot of hand finishing was then required to attain a smooth, even layer. The only way to compact this type of material is by saturation with water. Because a wheeled water cart would not drive on the sand, it had to be watered by hand.

Grading of Birdlings Flat Sand

% Passing	Sieve Size
100	3/4 - 19.0mm
98	3/8 - 9.5mm
94	3/16- 4.8mm
91	7 - 2.4mm
75	14 - 1.2mm
28	25 - 0.6mm
6	52 - 0.3mm
0	100 - 0.15mm

Limestone Coarses

At the time of tendering for the Papanui Diamond, only a vague specification as to the properties required for the limestone was available.

It was basically a matter of trial and error to find a material that best suited the required criteria of permeability, hardness and particle size grading. Samples of all the limestone quarries within economical distance from Christchurch were gathered and tested. None met all the criteria. Most were too soft and the only one that met the hardness criteria was not available in the required size range. All that was available was agricultural lime which was too fine and limestone chip which was too coarse. Unfortunately, the company's plant was not capable of producing a "happy medium". It was then decided to construct the lime in two layers - 150mm of coarse lime at the bottom and 75mm of the fine lime at the surface.

This material, although better than the sand, was still difficult to work. Once again, the material was dumped around the perimeter of the excavation and laid with a light dozer with final levelling by hand screeds. The most effective method of compaction was by rubber tyred roller and heavy watering.

By the time final levelling of the top surface was required, sufficient compaction had been attained to enable a light grader to be used. Final compaction again was by rubber tyred roller and heavy watering. Because it was not known to what extent the lime would compact, quantities of the two types of lime could not be calculated and it was basically a matter of place it and see.

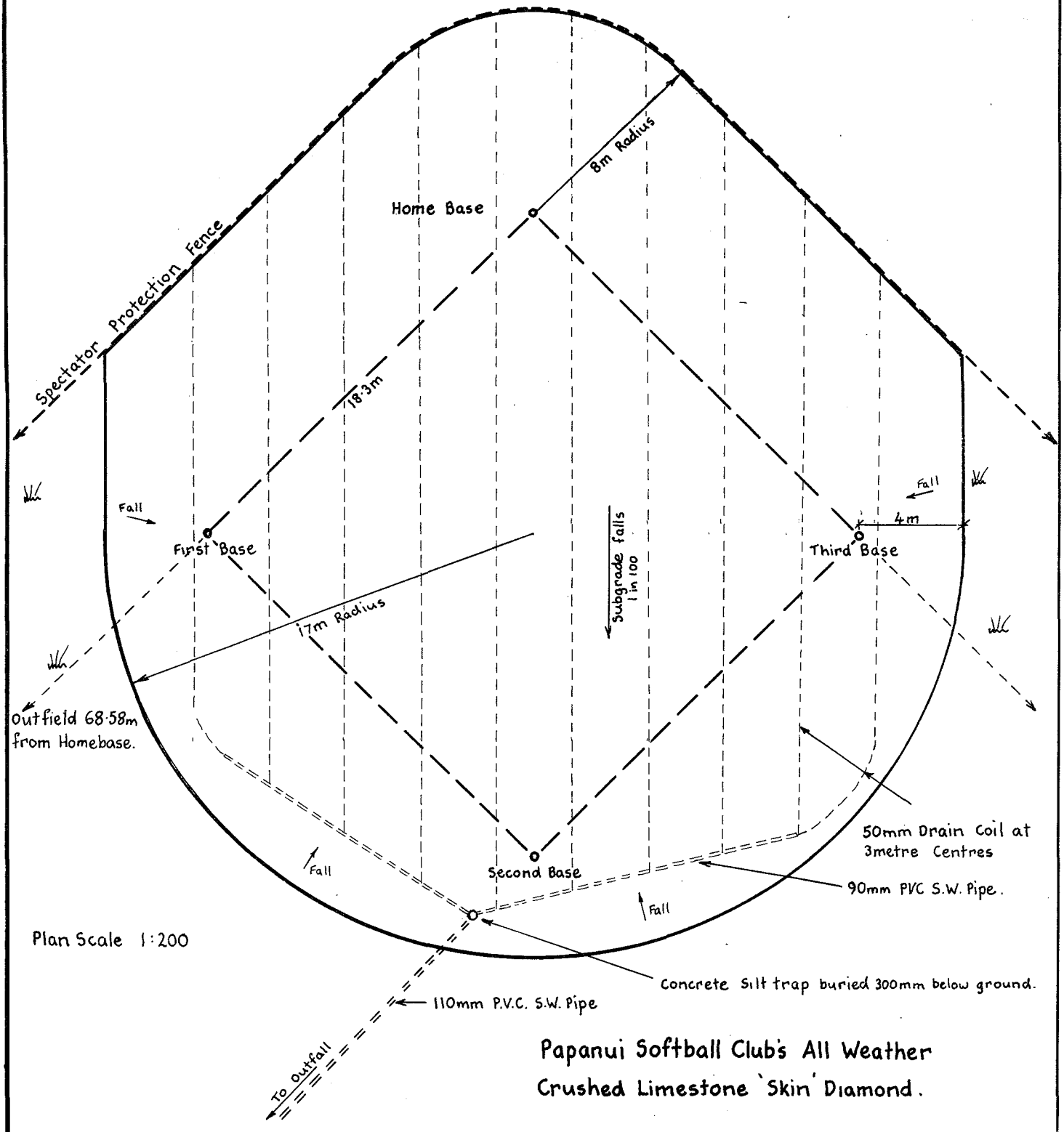
Physical Analysis of Limestone Sample

Sieve Size	% by Weight
>1mm	25.3
1 - 0.5mm	23.0
0.5 - 0.25mm	14.8
0.25 - 0.125mm	12.0
0.125 - 0.088mm	5.0
<0.088mm	19.9

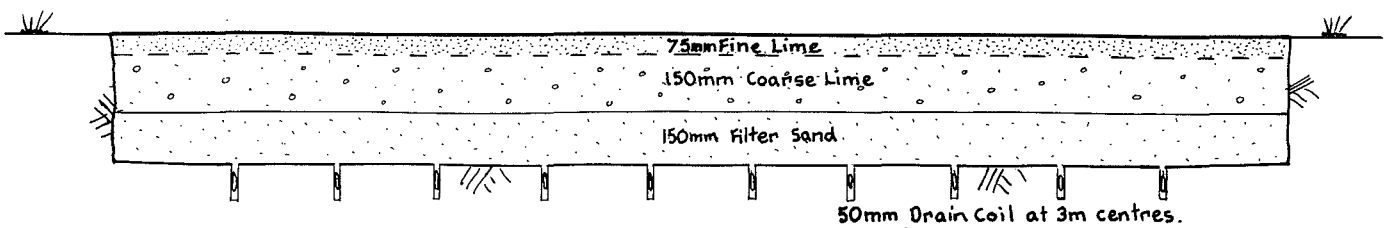
Permeability

77ml water collected in 72 minutes,
Head of water 9.9cm
Depth of sample 6.0cm
Diameter 5.0cm ∴ area 19.6cm^2

(True) water permeability 0.62micron^2
Hydraulic conductivity 3.27cm/hours



Papanui Softball Club's All Weather Crushed Limestone 'Skin' Diamond.



Cross Section

Scales - Horizontal 1:200
-Vertical 1:20

Base Anchor Points

Permanent anchor points may be required for the four bases. Careful consideration as to positioning is necessary to ensure they are placed correctly. These usually consist of concrete blocks buried beneath the surface. (These are not used at Papanui.)

Remarks

Lime skin softball diamonds are a fairly new innovation in New Zealand. The long term wearability of these is not known. Limestone is a fairly soft material that will weather and break down in a short period of years. Thus, it is important to use the hardest material available so that its permeability properties will last as long as possible. The grading of the crushed limestone material is also very important to allow the best combination of the required properties outlined in the introduction Page 1. Neither of the two types of lime used at Papanui was suitable if used on its own, but using them together in separate layers as was done, has resulted in an adequate playing area. I am of the opinion that a single layer of, say, 3mm maximum size down to 0.1mm minimum would give the best all round result provided the material was hard enough to give reasonable weathering.

The surface weathering, especially in the high use areas around the pitcher's mat and home, and first bases, is unavoidable. The surface will break down and this will probably result in "pugging" on the surface. At this stage, it will be necessary to either rotary hoe the lime to a depth of several centimetres (in the case of the Papanui Diamond, care will be needed not to go down into the lower layer), or remove the surface layer completely and replace with new material. This would probably only be necessary in the worst areas. Heavy raking and levelling will also be necessary periodically to keep the surface level and playable.

Costs

The approximate costs for the initial diamond area constructed by Blake Bros. Contracting Ltd., were:

Excavation	$2,500
Drainage	$2,600
Filter Layer	$2,700
Lime Coarses	$5,500
Total	$13,300 (1980)

The initial area did not extend right to the spectator fence and left an untidy 4m wide grass strip between the lime playing area and the fence which is hard to maintain.

****

Wooden floors take a lot of beating. *(Refer P.53.)*

LOCAL AUTHORITY BUDGETING PRINCIPLES FOR CAPITAL WORKS

D.E. Pearson

INTRODUCTION

The subject which I have been asked to talk on today is Local Authority Budgeting Principles for Capital Works. Realising that this seminar is on the subject of "Artificial Surfaces for Recreation" I am sure you do not wish to hear me talk of how you finance a major sewer scheme or a major water scheme. Therefore, I will endeavour to relate my remarks to capital works for recreation although not necessarily to artificial surfaces for that purpose.

Before dealing with the subject specifically, I feel I should make some general comments which I trust will help you to better understand my attitude to financing the capital works of a recreation department.

I do not accept the concept that applies on so many occasions when a Parks and Recreation Department is thought of as "that group of fellows down the road who spend their time growing flowers and cutting grass", nor do I think of a Parks and Recreation Department as being a department of the Council associated only with sport. Recreation, when thought of in the context of local authority responsibility, must take into account passive and active pursuits, sporting and cultural activities and, in fact, the whole ambient of activities which occupy the leisure hours of the residents of the area.

Because of my attitude to recreation in general, I am convinced that a Parks and Recreation Department must be fully and properly integrated into the overall activities of the local authority, not only from an administrative point of view, but also from a financial point of view. Most local authorities have a separate council committee to decide matters of policy relating to Parks and Recreation, but it is not sufficient that members of the committee only are made fully aware of any

proposals for capital works in the department. All councillors must be fully informed so that due recognition is given to the proposed works and that particular projects are accorded due priority in the overall activities of the local authority.

I am sure that all of you present here today appreciate that because of the nature of the activities of a Parks and Recreation Department there is in general terms very limited income generated, and consequently, the main costs in running such a department bear heavily on the rating and general revenues of the authority. Apart from this, the activities of a Recreation Department are not normally thought of as essential, but more in the classification of desirable when compared to works such as sewage and water facilities. These two factors combined with all councillors not being kept fully informed does, on many occasions, result in the Parks and Recreation Department being thought of as the "poor relation" or as a "Cinderella department". This attitude often results in councillors, when considering financial matters of the Recreation Department, taking out the pruning shears and doing some trimming in anything but an expert manner.

I will now turn to deal more specifically with the budgeting for capital expenditure for recreation and in doing so propose to deal with the subject under the four main headings of:

(a) Planning of capital works;

(b) Programming of capital works;

(c) Sources of funds for capital works; and

(d) Control of projects.

Planning of Capital Works

Without any doubt in my opinion, there is insufficient planning for capital works undertaken by local authorities. This lack of planning is particularly applicable in the areas of recreation.

All too often do we have a director of recreation, a councillor, a sporting body, or a pressure group who suddenly decide that some project involving either a little or a lot of capital expenditure is essential and should have been completed yesterday. Maybe in the past projects

raised in this manner were capable of being achieved in very short time, but with the major changes in the complexity of Local Government, the higher standards demanded by residents, the effects of inflation and the generally greater difficulty in financing local authority works, the need for medium to long term planning of capital works has become essential.

An Objective

Bearing in mind what I said previously as to the Parks and Recreation Department being integrated into the overall activities of the local authority, I believe it is essential for a co-ordinated approach to be taken so that any project becomes part of a pre-determined capital works plan, or in other words, becomes an objective that the local authority wishes to achieve. To formulate such a plan, I see that individual departments of the council should prepare capital works plans on a three to five year basis for the capital works required within their department. These departmental capital works plans require to be collated into an overall capital works plan which can be considered by the council for the purpose of establishing priorities for individual works taking into account the availability of finance. I will refer to this aspect later in this address.

It is not sufficient to include projects in a capital works plan at the whim of the director, a councillor or a pressure group. Each project should be given preliminary consideration either by the corporate management team of the local authority or by the appropriate committee of councillors, so that it can be established that the project is either essential or desirable and that a preliminary estimate of the cost is acceptable. If there is agreement that the project should be incorporated in the overall capital works plan, it should be included and then the detailed planning of the project should be commenced.

The planning of a project once incorporated into the overall plan should establish all relevant factors relating to the project. It should determine the technical feasibiltiy, the need or desire from a social point of view (for example, the number of people who are going to use or benefit from the amenity), an accurate current day cost, a cost of maintaining or operating the facility and a priority

within the department's own capital works plan.

Timing

Once the preliminary planning of a particular project has been undertaken a more informed decision can be made on the timing required for the project, but it must be remembered that the basic information must be able to be reviewed or reconsidered, preferably on an annual basis so that any amendments to the department's and the local authority's overall capital works plan can be made annually and then be reviewed as a major undertaking after each triennial election.

The planning that I have been alluding to has been the medium to long term planning, and is not the detailed planning for the undertaking of the physical works.

In determining or establishing long term plans, I believe there is considerable obligation on departmental heads and other officers as well as on councillors for them to forego their parochial interest in their own works only, and view the various proposals in the plan on the basis of an integrated authority. This attitude must be present when determining priorities for work and although it may appear that the overall approach works to the detriment of a particular proposal in that it is delayed, I think that on many occasions the opposite is the case. Nowadays there is much greater public awareness, discussion on and regrettably, criticism of local authority projects, and I see that many of the difficulties that are experienced by this public awareness can be overcome by making the residents of the area fully aware of the various projects and the council demonstrating that it is working towards a set of objectives and undertaking a programme of balanced development within the various areas of the local authority's activities.

In the case of recreational projects which on so many occasions are considered to be desirable rather than essential, adequate planning and public awareness of the authority's objectives greatly assist in public acceptance of a proposal and effectively allows it to be brought to fruition at the earliest possible time.

Programming for Capital Works

Up to now I have been talking in the term of planning in the medium to the long term using a three to five year period as a base. I have talked of items being placed on the plan, but another important facet related to that plan is the time schedule programming of the various works.

Priorities

The setting of priorities for capital works is the direct responsibility of the local authority. When members of the authority are considering the matter of priorities for capital works they should be informed of the latest information on the various factors taken into account when the project was incorporated in the capital works plan originally. By this, I mean that they should know what is the current level of need or desire, the current day cost, the current day cost of maintaining and operating the facility, the number of people who are going to benefit from or use the amenity.

Although ability to finance the project does come into it to some degree (in that the local authority may be able to finance a small project, but not a large one), in fact, the decision is that of the councillors. They were elected to make this type of decision and set objectives to be achieved on the basis of what they believe the residents of the area want. Always remember that the electors have the right to show their pleasure or displeasure every three years.

If each local authority officer, or committee chairman, took the attitude that the works in his department were of prime importance and must take precedence over all other work, little would be achieved. As I said a few moments ago, it is necessary for these people to put aside their parochial interests and take a realistic attitude in viewing the various proposals of the overall integrated authority.

Lead-up Time

When establishing the overall capital works programme, there are a number of factors which should not be forgotten. For example, each particular project will have a lead up time and the

lead up time for various proposals will differ considerably. Detailed plans, specifications and estimates will need to be prepared. On many occasions the project even though accepted by the council may have to be "sold to the public". There can be land acquisition, there can be loan proposals or a number of other details which will take time and prevent the project commencing immediately. All these factors, together with the local authority's order of priority must then be related to the local authority's ability to arrange finance. From this study there should devolve a capital works programme which the local authority can realistically hope to achieve.

You will note that I have used the expression "the local authority's ability to arrange the finance". I have not said the local authority's ability to meet the cost, and I will refer to this more particularly under the following section on financing of capital works.

Flexibility and Review

An essential part of the programming of capital works is flexibility. Just as there is a need to review the various items included in the overall plan, there is a need and a more important need to review the programming of individual works. On an annual basis, all works and projects should be reviewed to see if there has been any material change in the cost or benefits expected or of other changed circumstances and in the light of this information, any necessary changes to the programming of a particular work should be made. As I intimated before, the overall plan requires to be reviewed after a triennial election and the same situation applies so far as the individual programming is concerned.

To illustrate a method of establishing a capital works programme I have attached hereto a section of the capital works programme which relates to the Parks and Recreation Department of my own authority, but let me hasten to add that I do not consider our system to be perfect, but it is certainly better than nothing.

Sources of Funds for Capital Works

When financing local authority capital works there are basically five sources of funds. They are:

TIMARU CITY

CAPITAL WORKS

(Exam

Project	Project Status	Finance Source Suggested
Ashbury Park - Groundsman's House and Yard	4	Revenue
Ashbury Park Drainage	2	Reserves Development Fund
Caroline Bay - Redevelop toilets, aviary, yard, garden	1	C.B.A. and Reserves Fund
Caroline Bay - Southern Area Development - Resite Miniature Golf etc.	3	Reserves Development Fund
Botanical Gardens Public Conveniences	2	Botanical Gardens Development Fund
Botanical Gardens Conservatory	3	Botanical Gardens Development Fund
Botanical Gardens Irrigation	3	Botanical Gardens Development Fund
Anzac Square Drainage	2	Reserves Development Fund
Anzac Square Carpark for Pool	4	Reserves from Subdivisions
Centennial Park Development	3	Reserves Development Fund

COUNCIL

PROGRAMME DEPARTMENT: PARKS AND RECREATION

ples)

Estimated Total Cost ($000)	Programmed Expenditure 1981/82	1982/83	1983/84	1984/85
$	$	$	$	$
70			40	30
30	30			
100	100			
70	20	20	20	10
20	20			
100	50	50		
30		10	10	10
10	10			
10			10	
70	20	20	20	10

(a) From the revenue of the local authority;

(b) From loan monies;

(c) From special funds or reserves;

(d) From government subsidies; and

(e) From donations.

I will now make some comment on each of these five items, which all have their own particular advantages and disadvantages.

(a) From the Revenue of the Local Authority

If local authority revenue is used for a project it has the advantage that the council can determine what works it wishes to do and is in no way restricted by outside organisations. The proposed works are directly under the control of the council, and provided the revenue funds are available, the council can do as much capital works as it wishes.

However, these days there is not unlimited revenue finance available and the amount of capital work which can be done from revenue is restricted. The level of restriction to a very large degree is dependent on the size of the local authority - for example, my Council endeavours to undertake any capital works of less than about $100,000 from revenue.

The overall financial situation of any authority at a particular time determines the amount of capital works which can be financed directly from revenue. It is essential for the local authority before embarking on capital works to adequately provide for its commitments to the maintenance and operational cost of various activities.

It should also be borne in mind that in the case of capital works financed from revenue, the ratepayers of the day bear the full cost and no contribution towards the asset created is received from the ratepayers of the future.

(b) From Loan Monies

When financing capital works of a major or

urgent nature, most local authorities are forced to resort to loan monies.

This method of finance does have advantages, particularly for major or urgent works as they can commence at a much earlier date than would otherwise be the case. Loan finance also allows for the work to be done at current cost rates and ensures that future ratepayers contribute to the cost of the assets created.

In many cases there is no alternative but to resort to loan finance, but always remember that this method of financing a project has a major disadvantage in the interest factor. With the current high interest rates the total amount paid out for the creation of an asset will normally be three to three and a half times the original capital cost by the time the loan is repaid. For argument's sake, a project costing $1,000,000 will result in $3,000,000 to $3,500,000 being paid out for loan repayments and interest. This disadvantage is to some degree off-set by inflation, but there is also a further major disadvantage in loan financing in that any proposed works required to be approved by outside parties in that you can be sure Government departments will be involved in any proposals put before the Local Authorities Loans Board.

A further factor which must be considered is the time delay, not only in obtaining Local Authority Loans Board sanction and going through the necessary legal procedures, but after that there can also be difficulties on occasions in obtaining actual investments in the loan.

(c) From Special Funds or Reserves

Under this general heading, there are two sources of finance - monies which are derived from outside sources (e.g. reserves contributions on subdivisions), and secondly, monies allocated from the local authority's general revenues.

Little needs to be said about the special fund monies which are received from outside sources; the more money received in this way the better because of the greater amount of work that can be done. However, it must be remembered that on many occasions these monies are restricted as to what purpose they can be used for.

As a general comment relating to these monies, I would say that if there is sufficient monies available to undertake a project which has a reasonably high priority, use them. Let me hasten to add that I am not a believer that you should not have adequate balances in special funds - on the contrary, I am a firm believer that the accumulation of money in reserve funds is highly desirable provided it is being accumulated for a purpose.

This leads me into the establishment of reserve funds by the local authority.

I believe that by funding money - that is by putting away money to a reserve fund from revenue is one of the best ways of financing reasonably large projects provided that the project is to be undertaken within a reasonable period. Let me give you an example. If you have a project which is going to cost $200,000 and will not be due for completion for say three years, in most instances $200,000 cannot be found in one year from revenue. On the other hand if you raise a loan for the $200,000 by the time you have repaid the loan, the project will have cost you something between $600,000 and $700,000 in loan repayments and interest. If a funding method is used over the three year period the council can put away into a reserve $70,000 per year and be able to commence construction within say a two year period.

In general terms, interest derived from the investment of the fund money will go some way towards meeting the increased costs resulting from inflation, but you are not faced with the problem of meeting the high interest factor applicable to loan money.

There are two major factors this method of financing has - they are:

(a) It does not have such a major direct effect on the level of rating by the local authority; and

(b) That the monies within the overall general revenues of the local authority which have been put towards the capital cost of a project will normally provide more than sufficient funds to meet the maintenance and operating costs of the amenity after its completion.

(d) From Government Subsidies

Under current circumstances there are a number of Government subsidies available to local authorities, but the main ones applicable to the area of recreation are the Community Facilities at Schools Scheme, the Local Authority Community Facilities Fund and the Local Recreation and Community Development Scheme.

I do not propose to go into these three schemes in detail, but when planning capital works consideration should be given as to whether some finance can be derived from these sources. In the case of the Community Facilities at Schools Scheme, subsidies are available to encourage the development and wider use of community facilities based at schools and depending on the project some finance can be derived from this scheme.

The Local Authority Community Facilities Fund has been set up to encourage the provision by local authorities of community facilities which serve a substantial territorial area or a significant population centre. Although there are not unlimited funds available, the criteria for the allocation of funds provides for grants on the basis of not greater than one dollar for two with a maximum subsidy of $500,000 over a three year term with maximum assistance of $200,000 in any one year towards the project. This you can see is a substantial contribution and should be considered for major projects which qualify.

I am sure that you are all aware of the Local Recreation and Community Development Scheme which provides for one dollar per head of population to be allocated to Territorial Local Authorities for distribution. I must admit that this scheme concerns me to a degree in that on many occasions applications are received for assistance towards the cost of very minor projects and the advantages which can be gained from large contributions to bigger projects is lost.

I will not go into more detail on Government subsidies except to say there are funds available; make certain you consider whether your projects qualify for any subsidies.

(e) From Donations

Although I am not a believer that you can finance local authority works on the basis of donations, and although I am quite conscious of the fact that on many occasions pressure groups raise funds for a particular project which does not have high priority in the opinion of the local authority, there is, nevertheless, a source of funds available from donations.

I do not foresee that the local authority itself is going to be soliciting donations, but by the use of community organisations, or groups of people interested in a particular project, it is quite surprising how effective fund raising campaigns can be.

In my own case I have seen a stadium erected in Timaru, large enough to accommodate two full sized basketball courts, erected nine years ago at a cost of a quarter of a million dollars with all monies having been donated by the community so that the building opened debt free.

I do not propose to go into the detail of how you arrange fund raising schemes, but this is a source of revenue, and in some instances can provide financial assistance if not for the total cost of the project, then for some part of it.

The above are some general comments on the sources of finance available for capital projects, but the method of financing any particular project is entirely dependent on the overall financial position of the local authority.

I see advantages in as much capital expenditure as possible being financed from revenue, either directly or by funding, but the amount of actual expenditure is dependent on the size of the authority.

On many occasions there are advantages in using a combination of sources of revenue for a particular project, and all possibilities should be considered before a final decision is made.

Control of Project

Up to now I have been talking in terms of planning a project, programming it, determining how you are going to finance, but all your good work

can easily be upset if there is not proper control when spending the money.

At the time that a particular project is due to commence, target dates for commencement, the various stages of progress and for completion, should be set. Before going to tender for a project or before commencing the work yourselves, you should ensure that the standards set are not excessive. Do not set a minimal standard without taking into account future growth, maintenance requirements etc., but on the other hand, do not attempt to achieve the "gold plated" version as all too often this will delay commencement and just as importantly, attract adverse criticism at a later date.

During the course of construction there needs to be adequate supervision to ensure that the work is being done in accordance with the specifications, that the standard of workmanship is acceptable and that the target dates are being met. Do not forget that if target dates are not being met, the chances are the job will cost more than you originally anticipated.

As work progresses there is the possibility that you will have to make some changes to your original plans or specifications, but if your planning has been adequately undertaken, these changes will be minimal. There should be strict control as to who has the opportunity to authorise amendments or extras to the original proposals.

As a final point on the matter of control, can I leave a thought with you. It is difficult enough to find the finance to undertake local authority capital works, particularly those related to recreation, and the greater the cost of any one project the longer time it will be before you can commence the next project. Do not allow lack of control to increase your costs on one project to the detriment of a future project.

Conclusion

Mr Chairman, I have had some difficulty in determining what the expression "Local Authority Budgeting Principles for Capital Works" really means. I think the procedures for embarking on capital works within local authorities and particularly the recreational fields is just about as diverse as the local authorities themselves. However, if I had to

establish what the principles for budgeting for capital works are, I would say having an adequate plan, having a realistic programme for undertaking that plan, ensuring that the best method of providing finance to meet the costs of the work is used, and then ensuring that the control of expenditure is such that funds are conserved to the greatest degree possible.

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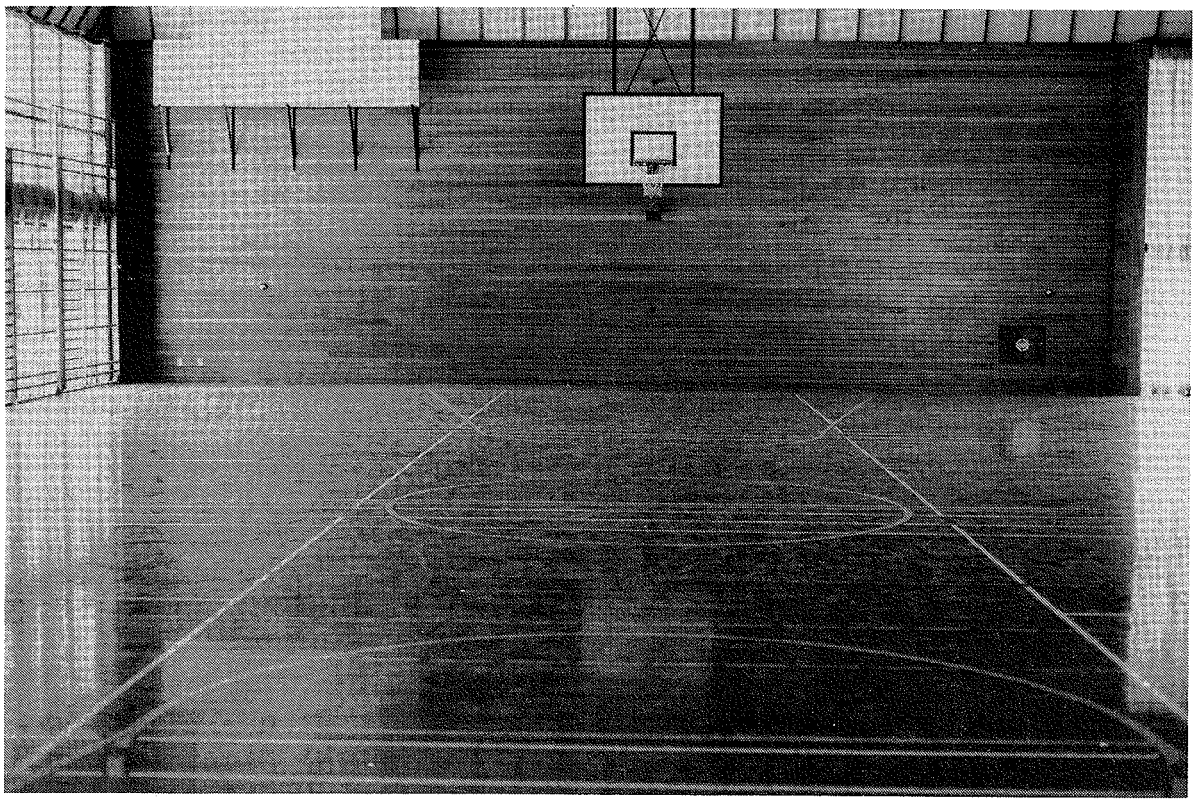

New wooden floor at Christ's College recreation building, Christchurch.

HOW FAR TO GO WITH THE USER-PAY PRINCIPLE?

Mr Neil Gow (Canterbury Rugby Union)

If we believe in the user-pay principle, should not the Botanic Gardens users pay extra for their special facilities? After all, the Rugby Union has to pay extra for the use of grounds in Hagley Park, and the Rugby Union supplies the goal posts, erects them and marks the grounds twice a year. In fact, the Rugby Union paid over $9,000 to the Christchurch City Council last year as its contribution on the user-pay principle. A hockey team is charged $340 per team for the year which is $30 per player. Aren't we gradually pricing our young people out of team sports?

Cr. Ian Clark (Waimairi County Council)

Someone has to pay for the provision and maintenance of our sports grounds. It is either the players or the ratepayers. It cost the Waimairi County Council $254,000 to maintain 15 large sports parks and 70% of this (i.e. $143,000) was spent on preparations and maintenance for team games. Our income from rentals, etc., from these same areas was $13,000 which is less than 10%.

As for community centres, our rental income was $9,500 and the running costs were $32,000, therefore, the community centre users paid 35% for their extra facilities.

DESIGN CONSIDERATIONS OF SQUASH COURTS

D. Cuseil

There are many variables in the design of a squash court. Many different materials can be brought together in many different combinations to give results with different characteristics.

Following are descriptions of various construction techniques and materials which may be used in the construction of a squash court.

1. Construction Materials

1.1 Pre-cut concrete

May be used plastered with a white sand/white sand cement plaster or cast with the white quartz sand/white Portland Cement surface finish cast integrally. The former method has been well tried, but there are instances of failure of the plaster finish, causing "drumminess" and consequent unsatisfactory playing surfaces.

The latter method has been successfully employed at the University of Canterbury Courts, where the white plaster was applied to freshly cast concrete tilt-up panels. The danger of separation of the playing surface from the structural wall is eliminated.

Pre-casting of playing walls will give a very true surface not as easily obtained with other construction methods. Where both sides of a wall are used as playing walls, a bed of white plaster is applied on the casting bed before pouring of the generally 150mm thick, structural wall, which then has the white top applied.

Painted surfaces may also be used in conjunction with pre-cast concrete, but this finish has attracted much adverse criticism from players and should be avoided.

1.2 Cast-in-place Concrete

With this method of construction, the surface finish is invariably white plaster.

1.3 Reinforced Concrete Masonry

As for cast-in-place concrete, walls of this material must be hard-plastered. The walls are most usually built of 200mm masonry units, which are reinforced and concrete filled.

1.4 Armourplate Glass Back Wall

To improve the visibility into the courts for spectators, armour plated glass back walls are now well established. The walls are built in panels approximately 1.0m wide, and attached to glass ribs which are fixed to and cantilever from the floor. Although of high capital cost, this can be quickly recouped by the provision of vastly increased (paying) spectator accommodation.

2. Floors

Floors are generally unsprung 25 or 40mm thick Heart Rimu or Beech, with the boards running parallel to the side walls. Depending on personal preferences of players, these floors have been isolated from the concrete structural slab using fairly rigid rubber pads, giving a degree of springing.

Timber floors may be layed on floor joists and sleepers on piles, as in collage construction, or on bearers attached to a concrete sub-floor.

Whatever construction is used, adequate sub-floor ventilation must be provided and in the latter type of construction, a narrow gap of up to 10mm width, is provided along the side walls.

3. Ceilings

Ceilings should be reflective and preferably accoustic, to absorb the noise generated on the court. As all other surfaces are hard, and

non-absorbent, ceilings are the only means of controlling noise. Furthermore, given the economic limitations on the height of squash courts, they are usually well in range of high shots, and consequently, must be of a robust material. These various requirements appear mutually exclusive, and a compromise between strength and sound absorbing has to be accepted.

Common materials are suspended system using vinyl clad compressed fibre-glass batts, good sound control, but low strength, or Woodtex, a panel made of wood shavings impregnated with cement, which is quite strong, but "harder" from a sound absorption angle.

4. Lighting

No natural light, which is not easily controlled and will cause glare, should be permitted. Lighting is generally by fluorescent tubes, arranged to give a higher intensity of light on the front wall. Wire guards must be provided to protect the tubes.

5. Ventilation and Heating

With the requirements of a fairly cool atmosphere, the danger of condensation of moisture on the walls, with detrimental effects on the play is ever present. Good ventilation of the courts is required, and a rate of air circulation of five to six cubic metres/minute is recommended, combined with heating capacity of some 1.4kw/court. This may be achieved by circulating heated air vented to waste, air-conditioning, or fresh air ventilation combined with electric heating.

Pyrotenax heating cables built into walls have been successfully used to control condensation on these walls. Cavity walls, using two skins of concrete, concrete and masonry veneer, concrete and polystyrene steel clad, have been used to prevent the formation of condensation.

Capital cost of elementary heating and ventilation can be as low as $700-$1000 per court (May 1981) and running costs around 20c/hour.

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